JPRS 78034

8 May 1981

China Report

AGRICULTURE

No. 138

General Treatise on Agricultural Geography

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78034

8 May 1981

CHINA REPORT

AGRICULTURE

No. 138

GENERAL TREATISE ON AGRICULTURAL GEOGRAPHY

Beijing ZHONGGUO NONGYE DILI ZONGLUN [A GENERAL TREATISE ON AGRICULTURAL GEOGRAPHY OF CHINA] in Chinese Oct 1980 pp i-vi, 1-454

[Selected portions from journal compiled by the Economic Geography Research Laboratory of the Geography Institute of the Chinese Academy of Sciences]

[pp i-ii]

[Text] Foreword

Chairman Mao taught us: "Measures must be suited to the circumstances of the locality and the time. For different places and times, the method of development of agriculture also differs....When we guide agriculture, we must use different methods for different places....Not only must the large areas be differentiated, but even in a county, a ward, and sometimes even in a village, differences must be made....Carefully study the objective situation to propose definite demands according to the different places and different times and to solve the conditions for increasing production" ("Economic Problems and Financial Problems," Northeast Bookstore, 1949 edition, pages 11-12). Chairman Mao's idea of "suiting measures to local circumstances, guiding separate regions" profoundly reflects the objective patterns of agricultural production. The idea transcends all important directives and decisions of the party and the government concerning agriculture since the founding of the nation. It is the basic principle guiding agricultural production and it also points the way for agricultural geography to combine with productive practice.

Our nation's territory is expansive, natural conditions and natural resources are rich and varied. Agriculture has a long history of development. In the past 30 years after the founding of New China, our nation's broad masses of working people took up the heroic spirit of fearlessness, fought the heavens and battled earth, utilized nature, reformed nature, developed agricultural production, obtained remarkable achievements, accumulated rich experience,

causing our nation's agricultural geography to undergo great change. Agricultural geography is a science that studies mainly the pattern of regional differentiation in agricultural production. By studying these patterns, a scientific reference can be provided for suiting measures to local circumstances and rational distribution of agricultural production. If we summarize the remarkable achievements of our nation's working people since the founding of the People's Republic of China in utilizing and reforming nature and in developing agricultural production by suiting measures to circumstances and in distributing agricultural production via extensive surveys and research and using the various research achievements already made to analyze and study the conditions, characteristics and existing problems in the development and distribution of agricultural production of each region and each department of agriculture, forestry, livestock production, sideline production and fishery production and propose a direction and path for further development on the basis of summarizing the practical experience of the masses, then, the new face of our nation's agricultural geography can be fully reflected, and a complete set of systematic scientific data and scientific suggestions concerning the development of agricultural production and distribution can be provided. This will help the leading agencies to better implement their work in suiting measures to local circumstances and guiding separate regions. Based on this idea, we proposed to write "A Series of books on China's Agricultural Geography" in the winter of 1972. The proposal immediately received enthusiastic response from the geography circles throughout the entire nation and also great support from the Chinese Academy of Sciences and the Ministry of Agriculture and Forestry. The first coordination and cooperation meeting on writing the "Series of Books on China's Agricultural Geography" was held in Beijing in April, 1973. The meeting decided that the whole series will include 31 volumes, including one volume of a general treatise on the entire nation and 30 separate volumes for each province, city and autonomous region.

"The General treatise on Agricultural Geography of China" was mainly compiled and written jointly under the sponsorship of the Geography Institute of the Chinese Academy of Sciences and some coordinating and cooperating units organized by the institute. Work began in 1974 and was completed in 1978, spanning nearly 5 years. During the course of compilation, already available information of the past was widely gathered. Agricultural production and scientific research departments of each province, city and autonomous region throughout the nation were visited, 200 to 300 key counties, and typical communes and brigades and state run farms were profoundly surveyed. The bureaus and offices of the Ministry of Agriculture and Forestry and the agricultural and forestry departments of each province, city and autonomous region greatly supported this work and broadly provided related information and opinions, and thus, this project was completed smoothly.

The book is divided into nine chapters separated into three main parts: Chapter I to Chapter III belong to the comprehensive part. They evaluate the natural conditions of agriculture, explain the historical and geographical foundations, explore rational utilization of land resources. Chapter IV to Chapter VIII belong to the departmental part. They respectively explore the development and distribution of food grains, economic crops, forestry, livestock and aquatic production. Chapter IX describes the development of agricultural zoning. Be it departments or separate regions, the central topic is always "suiting measures to local circumstances and rational distribution" to

evaluate the conditions for agricultural production, to describe in general the characteristics of the development and distribution of production, analyze the problems that exist in the development of production, summarize the effective experiences of the masses, explore the direction and paths for further development. Therefore, this book encompasses both fundamental and productive characteristics. It is concerned with the systematic and scientific information of agricultural geography and it is also concerned with the exploration of and suggestions for problems in present production.

Because our nation is expansive, there are many agricultural departments and many varied crops. Our limited manpower and limited time do not allow us to conduct an overall survey and study. We can only conduct key surveys and studies of food grains, cotton, oil bearing crops, sugar, forestry, livestock and aquatic production. No special surveys and studies have been conducted for some secondary departments and crops such as bast fibers, silk, tobacco, tea, fruit trees, economic crops, etc. We only compiled already existing information, and therefore the content of this book seems to be uneven in detail. Of course, because of the broad scope and the many problems, even questions concerning the distribution of food grains and cotton which were carried out as key topics were not thorough enough.

Because of the relatively long period of compiling and writing this book, the information gathered is not for the same years. In general, national statistics are mainly taken from 1978 but the nationwide county statistics are mainly from 1971, which are slightly outdated. But it is fortunate that the emphasis of this book is on analyzing and studying characteristics, trends and problems, not absolute numerical figures, and slightly outdated numbers do not greatly affect the conclusions.

Surveys and gathering of information for this book were mainly conducted between 1974 and 1976 during the period of rampage of the "gang of four." Because the party's superior tradition of seeking truth from facts was seriously sabotaged, many phony "typical cases" emerged. Although during the course of editing and revision and finalization of this book all efforts were made to validate them, because it was impossible to go back to the basic levels of each province to repeat the surveys, therefore this book will surely contain some unrealistic examples. It is hoped that they will be pointed out by readers who discover them.

The party Central Committee under the leadership of Comrade Hua Guofeng crushed the "gang of four," the national situation developed rapidly, and many new situations and beginnings emerged on the agricultural front. However because this book was finalized rather early, these new situations are not reflected. They will have to be included in further surveys and studies in the future. The jurisdiction of the Nei Monggol Autonomous Region has been adjusted since January 1980. The content of this book describes the situation at the time of the surveys and corresponding changes have not been made.

Parts of the preliminary draft of this book mentioned the solicitation of opinions at the third coordination and cooperation meeting for the writing of the "Series of Books on China's Agricultural Geography" held in Suzhou in October 1977. The entire preliminary draft was submitted to the Ministry of Agriculture and Forestry and other concerned departments to solicit opinions and at the review meeting held in Nanjing from April to May 1978, each section of each chapter was discussed and reviewed, and then the original authors revised and touched up the entire text.

This book is the collective achievement of 21 comrades of the 6 units of the Geography Institute of the Chinese Academy of Sciences (11 persons), the combined inspection committee (6 persons), Gansu Normal University (1 person), North China Agricultural University (1 person), Survey Team of the Forests of Daxinganling of the Ministry of Agriculture and Forestry (1 person) and the Chengdu Geography Institute (1 person). Major writers of the separate parts are: Chapter I, Deng Jingzhong [6772 7234 0022]; Chapter II, Zhang Zhongwei [1728 0112 1218], Huang Mian [7806 0517] (the part in this chapter on the expansion of ancient agricultural and planting regions was taken from the research achievements of Wang Yuhu [3769 3022 3840] of the North China Agricultural University); Section 1 of Chapter III and drawing of the general map of the present situation of utilization of land in China, Shen Xiangren [3088 6272 0088], Section 2, Cai Qingquan [5591 3237 3128], Zhang Haoxi [1728 6275 4406], Kang Qingyu [1660 1987 4416], Section 3, Wu Chuanjun [0702 0278 6874]; Chapter IV, Wu Chuanjun [0702 0278 6874], Xu Zhikang [1776 1807 1660], Li Rongsheng [2621 2837 3932], Cai Qingquan [5591 3237 3128]; Section 1 of Chapter V, Huang Mian [7806 0517], Section 2, Xu Peixiu [1776 1014 4423], Jiang Dehua [1203 1795 5478], Huang Mian [7806 0517], Section 3, Deng Jingzhong [6772 7234 0022], Li Kaiming [2621 0418 2494], Section 4, Guo Huancheng [6753 3562 2052], Cao Guangzhou [2580 0342 0587], Section 5, Huang Mian [7806 0517]; Chapter VI, Liu Shoubo [0491 1108 3134], Guo Huancheng [6753 3562 2052], Chapter VII, Dong Wenlang [5516 2429 2597], Shen Changjiang [3088 7022 3068], Wang Guangyin [3769 1684 7336]; Chapter VIII, Li Rongsheng [2621 2837 3932]; Chapter IX, Section 1, Deng Jingzhong [6772 7234 0022], Section 2, Cai Qingquan [5591 3237 3128], Section 3, Xu Zhikang [1776 1807 1660], Section 4, Jiang Dehua [1203 1795 5478], Sections 5 and 6, Li Rongsheng [2621 2837 3932], Section 7, Xu Zhikang [1776 1807 1660], Section 8, Wu Chuanjun [0702 0278 6874], Section 9, Ni Zubin [0242 4371 1755], and Cheng Hong [4453 7703]. Finally, the entire book was revised and finalised by Wu Chuanjun [0702 0278 6874], Deng Jingzhong [6772 7234 0022], Xu Zhikang [1776 1807 1660] and Song Jiatai [1345 1367 3141] of the Geography Department of Nanjing University.

Most of the illustrations in this book were drawn by Shen Xiangren [3088 6272 0088]. Li Yanfang [2621 7159 5364] also participated in the drawing of some of the illustrations. All illustrations were completed by Zhou Xicheng [0719 3356 3397], Liu Jirong [0491 4949 2837], Chen Jiexiu [7115 2638 0208], and Zhang Guozhen [1728 0948 3791] of the Geography Institute.

Most of the photographs in this book were selected from photographs of the Chinese Photograph Agency and provided by the Beijing Agricultural Exhibition Hall of the Ministry of Agriculture and Forestry.

October, 1978

[pp iii-iv]

[Text] Table of Contents

[page 18] [Text] Table 1-6 Heat Zones and Conditions of Crop Distribution

Heat zone	Cold temperate zone	Mid temperate zone	Warm temperate zone	Northern subtropical zone	Central subtropical zone	Southern subtropical zone	Tropical zone
Regions included	Northernmost part of Heilongjiang Province	Most of the Northeast except the southern part of Liaoning, entire region of Nei Monggol north of the Great Wall and Qilianshan, most of Ningxia, northernmost parts of Hebei, Shanxi, Shaanxi, western part of Gansu and northern parts of Xinjiang.	South of the Great Wall, provinces and regions of the middle and lower reaches of the Yellow River north of Qinling and Hui River, southern Liaoning, region south of Tianshan in Xinjiang and region west of Yumen in Gansu.	South of Qinling and Hui River, region north of the line through Hangzhou-Jiujiang-Yiyang and Han River Valley	South of Dabashan and the line through Yiyang-Jiujiang-Hangzhou-north of the line through Fuzhou-Shaoguan-Liuzhou-Tengchong, including regions south of the valleys of the middle and lower reaches of Changjiang, and most of the regions of the Sichuan Basin and Yunnan-Guizhou Plateau.	Northern and central Taiwan, southern Fujian, most of Guangdong, central and southern Guangxi and central and southern Yunnan.	Leizhou Peninsula, Hainan Island, islands in the South Sea, southern tip of Taiwan, border regions of southern Yunnan.
Period without frost and freezing (day)	<100	100-160	160-210	210-250	250-300	300-365	365
Continuous duration of daily average temperatures ≥10°C(day)	<100	100-170	170-210	210-240	240-270	270-350	350-365
Cumulative temperatures ≥10°C	<1600	1,600-3,400	3,400-4,500	4,500-5,000	5,000-6,500	6,500-8,000	7,500->8,000
Temperatures of the coldest season (°C)	<-30	-30--10	-10-0	0-3	3-10	10-15	>15
Temperature of coldest month (°C)	<-20	-20--8	- 8- 1	1-4	4-12	12-16	>16
Average annual absolute minimum temperature over many years	<-42	-42--22	-22--12	-12--6	-6-0	0-3	> 5
Extreme lowest temperature (°C)	<-45	-45--30	-30--15	-15--10	-10--2	-2-0	> 0
Temperature of hottest month	<20	20-25	22-28	26-28	26-30	>28	>28
Major crops that can be planted	Early maturing spring wheat, barley and potato	Spring wheat, soybean, corn, millet, sorghum, paddy rice, partial winter wheat, early maturing cotton, mainly one crop a year	Winter wheat, cotton, paddy rice, peanuts, triple cropping in two years or double cropping a year	Ordinary rice and wheat of double cropping a year, popularized double season rice and triple cropping system of double season rice and winter crop, to the south, sugar cane, oil tung tree and tea tree can be planted.	Ordinarily, double season rice, sugar cane and subtropical woody economic crops can be planted.	Double and triple cropping of rice a year, winter planting of sweet potato and corn. Banana, pineapple, longan, litchi can be planted throughout, rubber can be planted in microenvironments.	Triple cropping of rice a year, four croppings of sweet potato, suitable for various kinds of tropical economic crops, unsuitable for growth of winter wheat.

[pp 62-66] [Excerpts]

Section 3 The Great Achievements of New China in Reforming and Utilizing Nature and Developing Agricultural Production

(I) Water Conservancy in Agriculture

1. Control of Major Rivers and River Valleys

The Yellow River valley is the cradle of the Chinese. It has a population of over 100 million and over 300 million mu of cultivated land. Because it flows through the loess plateau of loose soil texture, because of historical destruction of the vegetation and because of improper reclamation and cultivation, for a long period, the loss of water and soil has been very serious. Massive amounts of mud and sand have settled in the river channels of the lower reaches. The river beds are raised, forming the famous river of damage known for its silting, shifting and bursts. According to the records of 1933-1958 of the Shaanxian hydrological station in Henan, the annual amount of mud and sand that enters the Yellow River averages 1.59 billion tons. Of this, the amount from Shaanxi Province constitutes 40 percent of the average amount of sand entering the Yellow River at Shaanxian over many years, the amount from Gansu Province constitutes about 33 percent, the amount from Shanxi Province constitutes 12 percent, and the amounts from other provinces constitute about 15 percent. Most of the mud and sand of the Yellow River come from the northwest loess plateau region mainly because the loess structure is loose and the soil is easily washed away, rivers and trenches are close together, the slopes of river valleys are steep and are easily eroded; rainfall is concentrated in July, August and September and rain is intense. But the fundamental reason is that the ruling class of the past not only did not control the Yellow River well but seized resources, felled and cut trees without order and reclaimed land without order and seriously destroyed the vegetation. From the Qin Dynasty to the end of the Western Han Dynasty, over a period of 235 years, the Yellow River burst 62 times, from the era of Wang Mang to the beginning of the Sui Dynasty, a period of 580 years, the river burst only 2 times, from the beginning of the Sui Dynasty to the end of the Yuan Dynasty, a period of 779 years, the river burst 448 times, from the beginning of the Ming Dynasty to 1936, a period of 568 years, the river burst 461 times. "The reason why from the era of Wang Mang to the Sui and Tang dynasties the Yellow River did not overflow was that during that period, the loess plateau was under the control of the brother nomadic nationalities who changed the cultivated land back to grassland."[1] It can be seen that to completely control the Yellow River, water and soil retention work in the northwest loess plateau must be strengthened.

---

1. Tan Qixiang [6223 0366 7534], "Why a Long Period of Safe Flow in the Yellow River Occurred After the Eastern Han Dynasty," ACADEMIC MONTHLY, No 2, 1952.

After Liberation, Chairman Mao issued the great call to "do the work on the Yellow River well." For over 20 years, under the unified leadership of the party, overall planning and control of the Yellow River were carried out. In the regions of the middle and upper reaches of the Yellow River, measures were suited to circumstances to implement measures to control the mountains, control the water, control trenches, control the slopes, control the highland, control sand, plant trees, plant grasses, strictly prohibit unplanned reclamation and remarkable results were achieved. In windy and sandy regions, water was introduced to suppress the sand and forests were planted to stabilise the sand. In the loess hilly ravine regions, water level terrace fields were built, mountain trenches were dammed, mountains were closed to cultivate forests, grass was planted. River valleys were used as waterways, fields were created on river banks, flood water was drawn over land. Via this series of comprehensive measures, water, soil and sand were effectively intercepted and kept in the thousands of trenches and the tens of thousands of ravines and water, fertilizers and soil were kept on mountain slopes and sloping highlands. Dikes and dams were built along the two banks of the lower reaches of the Yellow River to prevent flood water. Reservoirs, culverts and power stations were built on mainstreams and tributaries to develop irrigation of farmland. Especially in the lower reaches, the prohibition against building water conservancy projects was broken and the precedent of drawing water from the Yellow River for irrigation was created. At the same time, the two provinces of Henan and Shandong in the region of the Lower reaches have to put forth massive labor forces each winter to elevate and thicken the big dikes extending over 1,800 kilometers. Each summer and autumn, an army of people watch over the water situation to prevent flooding and to inspect and repair the dangerous sections of the main dikes. Because such massive work and gigantic engineering projects were carried out, this "harmful dragon" has finally been conquered, bringing a greater change in the situation of the Yellow River valley which historically for a long period was a low yielding and disastrous area. According to statistics of 1971, 69 counties and many communes and brigades along the entire river valley reached or surpassed the "guidelines" in the production of food grains and cotton.

The Hui River is a major natural dividing line from north to south in our nation. Under the long period of rule by the feudalistic dynasties of the past and the reactionary Nationalist Party, the rich Hui River valley became a place that was desolate 9 years out of 10 and a place that suffered "from big disasters when there was big rain, small disasters when there was small rain, and from drought when there was no rain." Hundreds of millions of people lived a poor and devastated life. After Liberation, under the great campaign of Chairman Mao "to make sure to build the Hui River well," the people of the Hui River valley developed their heroic spirit of "man will surely conquer nature" and launched the work of preserving water and soil of the upper reaches in a big way, fully utilizing the favorable topography of the mountains and valleys, building reservoirs, blocking and detaining mountain floods. In the middle reaches, they utilized the lakes and lowland near the mainstream according to plan to build engineering projects to control water and implemented temporary measures to keep the floods and detain the floods.

In the lower reaches, waterways to lead the water into seas and rivers were opened and the outlets of flood waters were expanded. At the same time, dikes and dams were built all over the place and large and small river channels were dredged. At present, 5,000 large, medium and small reservoirs have already been built along the entire river valley. The total capacity of the reservoirs is over 23 billion cubic meters. There are over 10 projects to store and detain floods, controlling over 28 billion cubic meters of flood waters, over 10 new man-made rivers for draining and discharging flood water. The total discharge of the lower reaches of the Hui River and Yisi River increased from 8,000 cubic meters per second to 22,000 cubic meters per second. The irrigated area of the entire river valley increased from 12 million mu at the beginning of Liberation to 80 million mu. Especially in the Huibei region, the original irrigated area was only 1 million mu, now it has increased by several dozen times. Large expanses of saline and alkaline desert wasteland have already been rebuilt into good farmland. The total yield of food grains of the entire river valley in 1973 increased 1.4 times over that at the beginning of Liberation and the yield of cotton increased over fourfold. The Lixiahe region in northern Jiangsu and the southeastern part of the river valley is located in the center of Liyun River, Tongyang Canal, Tongyu Canal and the Main Irrigation Canal in northern Jiangsu. It is a depression of 18,000 square kilometers. It is lower than the surface of the four lakes of Shaobo, Gaoyou, Baoyin and Baima by 3 meters and lower than the ocean tide of the Yellow Sea to the east by 1.2 meters. According to historical records, for the past 100 years, this area has suffered from various disasters of floods, inner waterlogging, drought and tsunami 51 times, averaging once every 2 years. During the 25 years since Liberation, massive water conservancy construction was carried out and especially after completion of the Jiangdu water conservancy hub project, over 4 million mu of fields protected by dikes and waterlogged fields that were frequently covered by water and which produced one crop a year became high yielding fields producing a double crop of rice and wheat. Some fields changed from single cropping fields to triple cropping fields. The total yield of food grains increased over twofold from that at the beginning of Liberation. Today, Lixiahe has become a place producing an abundance of fish and rice, a place filled with rivers and canals, a place producing an abundance of all five grains, and a place of richness and beauty with willow trees lining the banks.

The Haihe River system is a harmful river on the Hebei Plain. The people of the Haihe River valley have responded to the great call of Chairman Mao to "make sure to completely control Haihe" since 1963 and launched a massive fight to completely control the Haihe. After 10 years of overall control of the 5 large river systems of the Ziya River, Daqing River, Yongding River, Northern Canal and Southern Canal as well as the river channels of 34 mainstreams of Tuhai River and Majia River, over 270 tributary river channels have been dredged totaling over 3,700 kilometers, 4,300 kilometers of main dikes for flood prevention were built, 1.7 billion cubic meters of earth were moved, the number of estuaries was increased to 11, the capability of draining floods and waterlogging was increased to 28,000 cubic meters per second, an increase of more than fivefold in the capability of discharging flood waters into the sea over that in 1963. The shortcoming of the Haihe River system was that it

was large at the upper reaches and small at the lower reaches, flood waters and water from waterlogging competed for waterways, it was turbid, it lacked a clear separation of salt and fresh water and it had a clogged up tail end. These shortcomings were basically changed. At the same time, 85 large and medium sized reservoirs and over 1,500 small reservoirs were newly built or expanded. The total capacity of the reservoirs reached 10.6 billion cubic meters. Under the support of the state, and relying upon the collective strength of the communes, mechanized wells were built in a big way. Between 1966 and 1972, over 497,000 mechanized wells were sunk. The area irrigated by wells reached 40 million mu, constituting two-thirds of the total irrigated area. Irrigated regions of over 10,000 mu numbered 27, and the area of irrigation by surface water increased 1.5 times over that at the beginning of Liberation. In this way, the mountains, water, forests, farmland and roads of the Haihe River valley were comprehensively controlled. In 1973, the yield of food grains of the river valley showed an increase of onefold over that of 1963. Some low yielding regions suffering from many disasters realized self-sufficiency in food grains with surplus. Since 1965, Hebei Province produced bumper harvests for 7 years consecutively. This greatly served to turn the situation of "transferring southern food grains to the north" about. The province's Heilonggang region is located in the eastern part of the Haihe River valley. The area of cultivated land constitutes over 40 percent of the total throughout the province. The agricultural population is 36.3 percent of the total of the province. In the past, Heilonggang was "barren in spring, flooded in summer, the cultivated land could hardly preserve the seedlings, only alkaline was seen but no food grains." In the delta of the confluence of the Fuyang river and Hutuo River were "Xianxina's 48 villages" that was a serious disaster area of flooding, waterlogging, drought and alkaline damage. From the beginning of the last year of the Eastern Han Dynasty to the present time spanning over 1900 years, each dynasty possessed records of controlling this area but no efforts were successful. In the Qing Dynasty, it was designated hopelessly as a "sure flood area." But after control efforts were made, the area began to supply commercial grains to the state beginning in 1971, and the situation of relying on unified grain sales was turned around.

The Changjiang is the largest river of our nation. Historically, flooding has also been very serious at times. The area of the Changjiang River valley is 1.8 million square kilometers with a population of over 300 million and cultivated land of over 400 million mu. It is our nation's main agricultural region. Changjiang is beautiful and rich. At the upper reaches is the Chengdu Plain known as "the heavenly place of riches." At the middle reaches are Hunan and Hubei praised by the saying "when the two provinces harvest, all the world will have sufficient food." At the lower reaches are the rich Caohu and Taihu valley and the Changjiang Delta that is the "bastion of riches within the sea." But in old China, water conservancy projects of the Changjiang were not built and drought and waterlogging occurred frequently. In 1931, the Changjiang was filled with water and the main dike of Jingjiang burst. The Jianghan Plain became an ocean drowning more than 260,000 people and several million people lost their homes, over 50 million mu of farmland was submerged under water. After Liberation, Chairman Mao issued the call "to seize victory in the project to divert the flood waters of the Jingjiang for the benefit of the people."

The people on the two banks of the Jingjiang built the famous Jingjiang flood diversion project and in 1954 the project exercised its important function and conquered the great flood that was much greater than the flood of 1931. For more than 20 years, control of the Changjiang has realized great achievements. The main dike of the Changjiang extending 3,100 kilometers was elevated and thickened and so were the secondary dikes extending over 30,000 kilometers, over 70,000 small reservoirs mainly for irrigation were built and over 500 large and medium sized comprehensive utilization reservoirs were built, many mechanical and electrical irrigation and drainage projects were newly built, and over 15,000 large, medium and small power stations were built. The irrigated area of the entire river valley increased from the 60 million mu at the beginning period of Liberation to 150 million mu. The area of high and stable yielding fields that can produce an assured harvest in drought and waterlogging conditions has reached over 100 million mu. The drainage and irrigation conditions of 5 million mu of lowland that easily waterlogged were improved. Because of the development of water conservancy construction, agriculture in the Changjiang River valley has continued to seize bumper harvests for more than 10 years.

3. Building Man-Made River Channels and Developing Irrigation in Regions Deficient in Water or Where Water Is Scarce

In 1949, the irrigated area throughout the nation was only 240 million mu and the standard of irrigation was very low. Up to 1978, this has expanded to over 670 million mu, constituting 45.2 percent of the area of cultivated land. In 1975, the area of the nation's high and stable yielding farmland that produces an assured harvest in drought and waterlogged conditions had already reached over 300 million mu, constituting 22.6 percent of the area of cultivated land. These are the very important and rich achievements realized by our nation's broad masses of farmers under the leadership of the party in the struggle against nature.

[pp 74-102] [Excerpts]

Chapter III The Question Concerning the Rational Utilization of Our Nation's Land Resources

Table 3-1 Estimated Areas of the Types of Land Utilization (1975)

Possibility of utilization	Types of Land Utilization		Area 10,000 sq kms	Area 100 million mu	Percent of total area of nation	Remarks
Utilized and that which can be utilized	Cultivated land		100.0	15.0	10.4	
	including:	Paddy fields	25.3	3.8	2.6	
		Dryland	74.7	11.2	7.8	
	Forest land		122.0	18.3	12.7	
	Grazing land					Grazing fields which can be utilized total 4.3 billion mu
	including:	Grassland	356.0	53.5	37.1	
	Water areas		33.2	5.6	3.9	
	including:	Swamp	11.0	1.65	1.1	
		Rivers	12.0	1.83	1.3	Figures of the Ministry of Agriculture and Forestry before 1963
		Ponds	1.7	0.27	0.2	
		Lakes and inland areas	8.0	1.2	0.8	
		Reservoirs	0.5	0.7	0.5	
	Icy rivers and permanently covered with snow		4.4	0.7	0.5	
Still unable to be utilized at present	Land used by residents and roads in cities and towns		46.7	7.0	4.9	Figures of the Ministry of Agriculture and Forestry before 1963; present figure has actually surpassed the above
		Desert	63.7	9.6	6.7	
		Gobi	45.8	6.9	4.8	
		High and cold deserts	15.0	2.2	1.5	
		Rocky mountains	43.0	6.4	4.5	
Other			130.2	18.8	13.0	Including scattered grassland, ditches, salt fields, coral reefs
Total			960	144.0	100.0	

(1) Land Which Is Usable and Which Has Been Utilized

1. Cultivated Land

(1) Changes in the development and characteristics of distribution of cultivated land

According to statistics of 1978, the nation had about 1.49 billion mu of cultivated land. Of this, paddy fields constituted 380 million mu, dryland constituted 1.109 billion mu, separately constituting 25.5 and 74.5 percent of the total area of the nation's cultivated land. Since the founding of the nation, our nation's total area of cultivated land has expanded due to large scale reclamation of frontier land and appropriate expansion of inland planting. But because a lot of land has been occupied by water conservancy projects, cities, transportation construction and industries and mines, the net increase is not large. The changes in the area of cultivated land can be divided into the following two stages:

1) Between 1950 and 1958, the area of cultivated land increased stably year after year. During these 9 years, the average annual increase was between 10 million and 20 million mu. Up to 1958, the area of cultivated land reached 1.68 billion mu, an increase of 14 percent over 1949, the highest figure of the past. During this stage, the cultivated land of each province and region throughout the nation increased on varying scales. Provinces that expanded their cultivated land by over 10 million mu included Nei Monggol, Heilongjiang, Henan, Guangdong, Sichuan, Gansu, Xinjiang, Anhui, and Shandong. Heilongjiang and Nei Monggol increased their cultivated land the most, registering an increase of 32 percent over 1949. The area of cultivated land in Guangdong increased 28.5 percent, and that in Henan increased 21 percent. The main ways of expanding the area of cultivated land were building state operated farms in a big way and encouraging the collective farmers to reclaim wasteland following the policy of walking on two legs.

2) Between 1959 and 1978, the total area of cultivated land gradually decreased. During this stage, the average annual reduction was 15 million mu. The reason for the decrease was mainly the expansion and new construction of cities, industries and mining industries, railroads, highways, large scale construction of water conservancy projects all of which occupied large amounts of cultivated land.

Because of the differences in the natural conditions and historical development of each region of the nation, the distribution of cultivated land at present is very imbalanced. Most are concentrated in the east while the expansive western and frontier and border regions have very little (Table 3-2).

Table 3-2 shows that the area of cultivated land of the 14 provinces and cities in the three great plains of the northeast, northern China and the middle and lower reaches of the Changjiang in eastern China constitutes 59.23 percent of the total area of cultivated land of the nation. The amount of cultivated land in Heilongjiang is the largest, constituting 9.23 percent of the national total, equivalent to the sum of the areas of cultivated land in the four provinces (regions) of Xinjiang, Gansu, Qinghai and Xizang in the west.

Table 3-2 Area of Cultivated Land of Each Province (City, Autonomous Region) of the Nation

Province (City, Autonomous Region)	Percentage of cultivated land in 1978 as a percentage of the national total	Reclamation index of 1978 (Cultivated land as percent of total land)
Beijing	0.43	24.10
Shanghai	0.36	62.10
Tianjin	0.47	42.16
Hebei	6.71	33.53
Shanxi	3.94	24.96
Nei Monggol	2.75	6.03
Liaoning	4.71	20.18
Jilin	5.08	17.11
Heilongjiang	9.23	12.83
Shaanxi	3.87	19.66
Gansu	3.58	6.66
Ningxia	0.90	5.26
Qinghai	0.60	0.83
Xinjiang	3.20	1.93
Shandong	7.34	47.58
Jiangsu	4.68	45.60
Zhejiang	1.84	18.01
Anhui	4.49	31.92
Jiangxi	2.54	15.35
Fujian	1.30	10.53
Taiwan	--	--
Henan	7.20	42.85
Hubei	3.79	20.04
Hunan	3.46	16.32
Guangdong	3.25	14.62
Guangxi	2.58	11.10
Sichuan	6.69	11.69
Guizhou	1.91	10.95
Yunnan	2.74	6.25
Xizang	0.22	0.18
Nation	100	10.35

Table 3-3 Structure of Paddy Fields and Dryland of Each Province (City, Autonomous Region) of the Nation (in percent)

Province (City, Autonomous Region)	1949		1957		1965		1978	
	Paddy fields	Dry-land	Paddy fields	Dry-land	Paddy fields	Dry-land	Paddy fields	Dry-land
Beijing	2	98	3.6	96.4	6	94	10.5	89.5
Shanghai	37	63	64	36	79	21	88.5	11.5
Tianjin	20	80	41	59	--	--	6.9	93.1
Hebei	0.6	99.4	2	98	2	98	1.6	98.4
Shanxi	0.1	99.9	0.2	99.8	0.2	99.8	0.3	99.7
Nei Monggol	0.2	99.8	0.3	99.7	0.1	99.9	0.2	99.8
Liaoning	1	99	5	95	3	97	8.1	91.9
Jilin	3	97	6	94	2	98	6.0	94.0
Heilongjiang	2	98	4	96	2	98	2.6	97.4
Shaanxi	3	97	5	95	4	96	4.4	95.6
Gansu	--	--	0.5	99.5	0.3	99.7	0.3	99.7
Ningxia	--	--	--	--	13	87	19.2	80.8
Qinghai	--	--	--	100	--	100	--	100
Xinjiang	0.5	99.5	3	97	2	98	2.3	97.7
Shandong	--	100.0	0.2	98.8	2	98	2.7	97.3
Jiangsu	3.9	61	46	54	47	53	58.9	41.1
Zhejiang	79	21	78	22	78	22	80.5	19.5
Anhui	34	66	36	64	36	64	39	61.0
Jiangxi	85	15	88	12	86	14	81.6	18.4
Fujian	79	21	81	19	81	19	80.9	19.1
Taiwan	--	--	--	--	--	--	--	--
Henan	3	97	5	95	5	95	6.0	94.0
Hubei	48	52	47	53	47	53	52	48.0
Hunan	79	21	75	25	78	22	78.2	21.8
Guangdong	67	33	73	27	76	24	75	25.0
Guangxi	75	25	64	36	79	21	64.1	35.9
Sichuan	51	49	48	52	49	51	49.7	50.3
Guizhou	47	53	44	56	40	60	41.9	58.1
Yunnan	42	58	38	62	36	64	37.3	62.7
Xizang	--	--	--	--	--	10	--	100
Nation	23	77	24	76	24	76	25.6	74.4

Table 3-4 Irrigated Land as a Percentage of Dryland in Each Province (City, Autonomous Region) of the Nation

Province (City, Autonomous Region)	1949	1957	1965	1978
Beijing	1.0	--	5.2	77.2
Shanghai	--	--	--	100
Tianjin	1.5	21.0	--	76.0
Hebei	7.0	22.0	24.5	54.1
Shanxi	3.9	14.4	16.8	27.6
Nei Monggol	1.1	15.0	18.0	23.7
Liaoning	--	1.6	1.8	17.3
Jilin	--	1.5	0.6	11.7
Heilongjiang	--	--	0.1	4.2
Shaanxi	3.4	14.1	11.2	29.4
Gansu	10.4	20.0	16.0	23.7
Ningxia	--	--	12.0	9.6
Qinghai	--	--	24.0	26.6
Xinjiang	94.0	93.0	96.0	92.3
Shandong	3.2	24	16.7	59.4
Jiangsu	--	6.8	2.4	31.3
Zhejiang	--	--	--	30.0
Anhui	--	9.1	0.5	25.1
Jiangxi	--	--	--	--
Fujian	--	--	--	--
Taiwan	--	--	--	--
Henan	2.3	37	110	49.2
Hubei	--	1.5	--	21.9
Hunan	--	--	--	--
Guangdong	--	--	--	--
Guangxi	0.3	1.8	2.2	7.1
Sichuan	--	--	--	--
Guizhou	--	--	--	0.4
Yunnan	--	--	4.2	5.9
Xizang	--	--	--	70.4
Nation	4.2	15.3	13.0	30.1

(2) Characteristics of the Distribution of Paddy Fields and Dryland in the Composition of Cultivated Land

1) Paddy fields: Paddy fields constitute about one-fourth the total area of cultivated land. Its distribution is very wide, from Hainan Island in the south to the Heihe region in Heilongjiang, from Taiwan Province in the east to the Kashgar Prefecture and Ili River valley in Xinjiang. Within this broad expanse, there are low marshlands and the Yunnan Plateau and mountain land at 2,700 meters above sea level which are paddy fields. The area of paddy fields south of the line from Qinling to Hui River constitutes 93 percent of the total area of paddy fields of the nation. This is because the region south of Qinling and Hui River is strongly affected by ocean monsoons. Rainfall is plentiful, the temperatures and dampness are within the same seasons, especially favorable to the cultivation and growth of paddy rice. At the same time, there are many rivers, lakes, ponds, dams, reservoirs in the region and the conditions for assured water sources are good, irrigation is convenient, the population is dense, labor forces are plentiful, all very favorable to the development of paddy rice production.

2) Dryland: Dryland covers an area three times that of paddy fields and it is distributed throughout the nation. But contrary to the distribution of paddy fields, dryland is concentrated north of the line from Qinling to the Hui River, constituting 85 percent of the total area of dryland throughout the nation. Dryland is most concentrated in the Northeast Plains and the Plains of the Yellow and Hui rivers, constituting about 60 percent of the total area of dryland of the nation. Dryland is also distributed in the loess plateau and alluvial plains in front of mountains and on oases in Nei Monggol, Gansu and Xinjiang distributed in the shape of tree branches or strips. The area constitutes 25 percent of the national total. In addition, 15 percent of the national total of dryland is distributed in strings in the hilly low mountain regions and plateau valleys south of Qinling and Hui River. The region north of Qinling and Hui River has less rainfall, water sources are insufficient, and at present, the water conservancy conditions are also relatively poor, the percentage of assurance of water for agricultural use is low, and the development of paddy fields is definitely limited, therefore dryland crops are the major crops.

After Liberation, as water conservancy projects developed on a large scale, the composition of our nation's paddy fields and dryland underwent historical changes: The proportion of paddy fields increased and the proportion of dryland gradually dropped, but the development in each province (region) was not balanced (Table 3-3).

It can be seen from Table 3-3 that in the southern provinces, except for Guangdong and Hubei provinces and Shanghai City which expanded relatively quickly, the rest of the provinces and regions did not expand much. In the northern provinces, because of the great improvement in water conservancy conditions, the irrigated area increased daily, and the proportion of dryland correspondingly lessened while the proportion of paddy fields steadily rose. Especially in the 3 provinces of Jiangsu, Anhui and Henan in the Hubei region, during the last 10 years, the area of paddy fields developed rapidly. The entire region

has 89 counties. As construction to control the Hui River progressed, measures were suited to local circumstances to "change dryland into paddy fields," and up to 1973, the entire region's area of paddy fields reached 8.46 million mu, an expansion of over fivefold over that in 1950, almost covering all counties of the entire region.

Another change in our nation's cultivated land was the rapid expansion of the area of irrigated land in dryland and the proportion increased year after year. In 1978, the area of irrigated land throughout the nation had developed to 334 million mu, constituting about 30.1 percent of the area of dryland. In regional distribution, the northern regions developed the fastest, especially the provinces and cities of Beijing, Tianjin, Hebei, Henan, Shandong, Nei Monggol and Shanxi (Table 3-4). This was closely related to the progress in the overall control of the three main rivers of the Yellow River, Hui River and Hai River (Figure 3-2).

(3) Problems in the Utilization of Cultivated Land

Since Liberation, the percentage of utilization of cultivated land in our nation has continuously increased. This is mainly reflected by the reform of the cropping system and the increase in the multiple planting indices. After Liberation, all regions of the nation more fully utilized water, soil and heat resources on the basis of continuous improvements in the water and soil conditions of farmland, implemented reform of the planting system, such as the selective use of early maturing varieties that produce bumper harvests, or interplanting, companion planting and such methods, and improved the cropping system. For example, in the northern dryland crop regions, because of the implementation of "changing dryland into paddy fields," many places changed from one cropping a year to triple cropping in 2 years, or two croppings a year. In the southern paddy fields, single season rice was developed into double season rice, one cropping a year was changed to two croppings a year, or five croppings in 2 years were changed to triple croppings a year. At present, the northern boundary of our nation's multiple planting has crossed the line of the Great Wall. Double cropping has extended northward to 34°N. In the Yunnan-Guizhou Plateau, multiple plantings have also been realized at an elevation of 2,420 meters above sea level. The boundary of triple croppings has also extended northward from 25°N to north of 32°N. Because of the continuous improvement of the cropping system, the multiple planting indices correspondingly increased year by year. The multiple planting index of the nation in 1952 was 130 percent. In 1956, it was 138 percent, and in 1975 it increased to 151 percent, and the multiple planting indices of each place increased in general and surpassed the indices of the "guidelines." The multiple planting indices in 1978 were: over 230 percent in the regions south of the Five Ridges; 200 to 230 percent in the regions north of the Five Ridges and south of the Changjiang; 160 to 200 percent north of the Changjiang and south of the Yellow River, Qinling and Bailongjiang; 120 to 160 percent in the region north of the Yellow River, Qinling and Bailongjiang and south of the Great Wall; 100 to 120 percent in the region north of the Great Wall except for a few counties and banners.

Although our nation's cultivated land had been greatly improved and developed after Liberation, many problems still exist and have to be solved. For example:

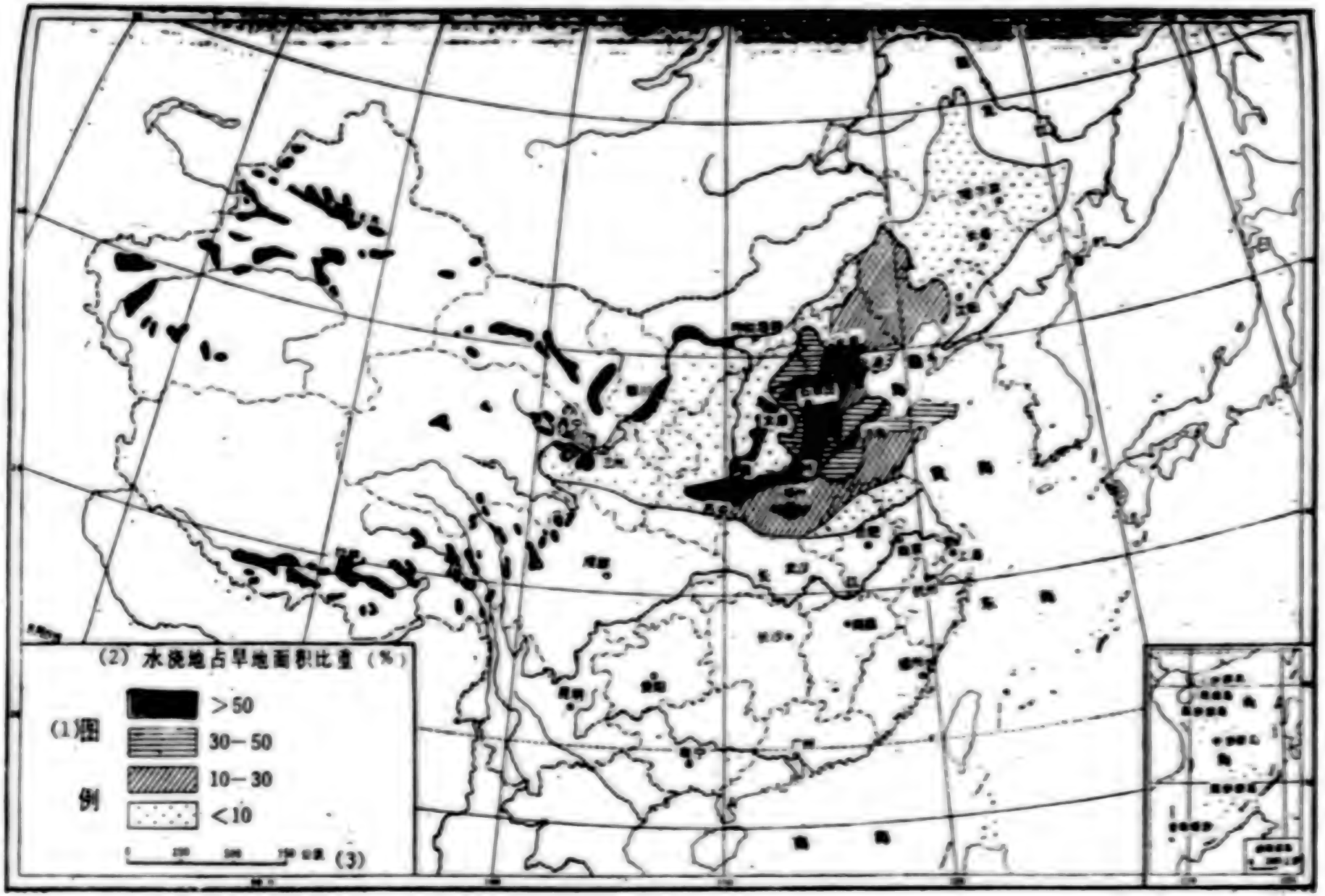


Figure 3-2 Distribution of Irrigated Land in Our Nation's Northern Regions

Key: (1) Legend (2) Irrigated land as a percentage of the area of dryland (percent) (3) Kilometers

1) The increase in the multiple planting indices is not rapid: According to statistical analysis, comparison of 1978 and 1952 shows the multiple planting index increased 20.1 percent, an average annual increase of 0.77 percent. Viewing the development through the years, the multiple planting index fluctuated. This is because each province's reform of crops was not fast enough and not firm enough. Also, there are still a lot of winter fallow fields and single cropping fields within the nation. In the northeast and the northwest, there is also a lot of wasteland and alternating cultivated and fallow land. All of these have affected the increase in the multiple planting indices. In addition, in some regions, the reform of the planting system fluctuated greatly because there was a lack of experience in improving the planting system, the masses were not relied upon to actively create conditions, to experiment, to use the experience of selected units to lead the work in the entire area, to suit measures to local circumstances to popularize the successful experience of reforming the system, the importance of reforming the system was unilaterally emphasized, conditions were not taken into consideration, and even strict orders were issued, and productive conditions could not keep up. As a result, increases in yield were affected, the economic results were poor, and the enthusiasm of the farmers in production was seriously dampened.

In the future, suiting measures to local circumstances to do the work in reforming the system well is still the main path towards increasing the multiple planting index and digging for the potential of utilization of cultivated land. As agricultural modernization is being built up, the conditions for reforming the cropping system will become better. But it must be popularized by suiting measures to local circumstances taking into consideration the actual conditions and characteristics of each locality. Attention must also be paid to combining utilization and nurturing of land to assure continued high yields, and combining the development of agricultural mechanization. According to the various multiple planting indices at present, the nation can be divided into six types of regions for consideration (Figure 3-3).

Regions below 100 percent: These mainly include the Qinghai Xizang Plateau, most of Xinjiang, central Gansu, Nei Monggol Plateau, eastern mountain regions of the northeast. Most of these regions are at high latitutdes and high elevations. Winter is long and cold. The frostless period is short, rainfall is scarce. At present, animal husbandry is the main form of agricultural production and cultivated land is limited. Except for the northeast which has small amounts of dryland, all of the regions require artificial irrigation. Especially the northwest arid region, without irrigation there is no agriculture. Another characteristic of these regions is that there is expansive land and few people, the labor force is insufficient, planting is not refined, alternating cultivated and fallow fields are plentiful. At present, except for the irrigated regions of Zhangye, Linze, Dunhuang, Gaotaixian, Ningxia in the Hexi area and Nanjiang which have scattered multiple plantings, the other regions do not have multiple plantings. In the future, the presently available alternating cultivated and fallow land should be fully utilized, and in localities where conditions are favorable, interplanting and companion planting can be used to increase the multiple plantings of the cultivated land.

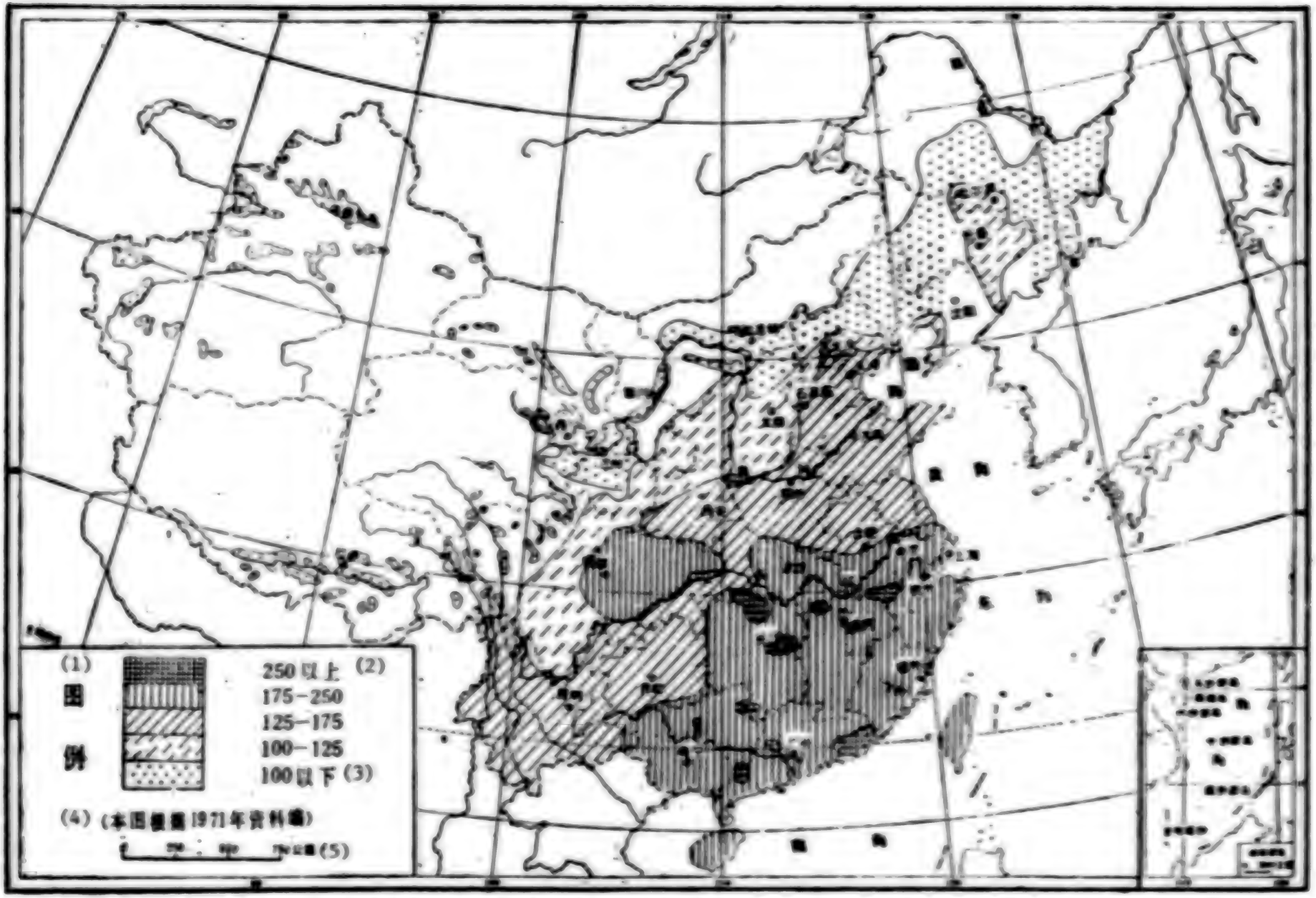


Figure 3-3 Distribution of the Multiple Planting Indices of Cultivated Land of the Nation

Key: (1) Legend
(2) Above
(3) Below
(4) This map is based on data of 1971
(5) Kilometers

Regions of 100 to 120 percent: These include mainly the loess plateau, the Northeast plain, eastern Gansu, Wudu and Xichang. The frostless period is between 150 and 180 days, the cumulative temperature ≥ 10°C is 3,500°C to 4,000°C, the annual rainfall is 400 to 500 millimeters, the water conservancy conditions are poor, paddy fields are extremely scarce, most of the dryland arecultivated land on slopes, the proportion of irrigated land is very low, the loss of water and soil is serious, the threat of drought is great, and under these conditions, a one cropping a year system of mainly dryland crop is formed. Multiple planting exists only in partial flat land and irrigated land. Mostly summer fallow or legume is used to increase fertility of the soil. The region has conditions for triple cropping in 2 years, and in the future, the multiple planting area can be gradually expanded.

Regions of 120 to 160 percent: These mainly include the plains of the Yellow, Hui and Hai rivers, the valley of Fen River, the Guangzhong Plain, southern Shaanxi and the Yunna-Guizhou Plateau. Most of the regions are plains and wide valleys, there are a few basins between mountains (plains), the soil is fertile, the climate is mild, the frostless period is 200 to 250 days, the cumulative temperature ≥ 10°C is 4,000°C to 4,500°C. Annual rainfall is 600 to 900 millimeters. The plains are well irrigated by ditches and wells. In the planting system, the single season summer rice and fallow system is popular in paddy fields and the winter wheat rotated with dryland food grains, sweet potato and beans in reverse cropping of the triple cropping in 2 years system is popular in the dryland. In the future, as water and fertilizer conditions improve, there will be conditions for double cropping or triple cropping a year.

Regions of 200 to 230 percent: These regions mainly include the middle and lower reaches of the Changjiang, southern Jiangsu, Zhejiang, Jiangxi, Hunan and Hubei and northern Fujian and the Chengdu Plain. Most of the regions are in the Subtropical Zone, heat is abundant, the growth period is long, water is abundant, irrigation is convenient, population is dense, labor forces are plentiful, production conditions are good. At present, except for partial mountain laid and hilly regions where the slopes are steep, the water sources are insufficient, irrigation is difficult, single season rice is still planted. Most regions are double cropping a year, and some regions implement the system of five croppings in 2 years of rice-rice-three wheat crops or rice-rice-green manure. In the future, besides expanding five croppings in 2 years, efforts can be exerted to realize triple cropping a year.

Regions of above 230 percent: These are mainly Guangdong and southwest Fujian. Here, winter does not bring severe cold, summer is hot, light and heat are plentiful, days of frost are few, rain is abundant, there are many people and less land, the planting of two rice crops and one potato crop is popular at present (or rape, vegetables, beans). Planting of triple season continuous cropping of rice is only concentrated in partial localities such as Changyelin Commune in Lingshui County on Hainan Island. In the future, emphasis should be placed on fully utilizing winter fallow land, expanding the area of winter planting and firmly establishing triple cropping a year.

2) The area of low yielding fields is large and it requires great improvement to increase the percentage of utilization. In 1975, of our nation's 1.5 billion mu of cultivated land, only 21 percent is high and stable yielding fields. There are also several 100 million mu of low yielding fields easily affected by drought and waterlogging, saline and alkaline land and land with serious loss of water and soil. After they are conscientiously improved, their potential for increased yields is great.

Our nation's alkaline and saline land is expansive in area and is widely distributed. According to preliminary estimates, there are about 400 million mu. They are mainly distributed in the coastal regions, low and flat lowland with poor drainage conditions in arid and semi-arid regions, and areas on the banks of rivers and lakes, including northern Jiangsu, the coast of Bohai, the plains of the Yellow and Hui rivers, the Songliao Plain, and Xinjiang, Qinghai and the region irrigated by the Yellow River in Ningxia in the northwest, and the Hetao area in Nei Monggol. The formation of these alkaline and saline regions is affected comprehensively by natural conditions of the climate of the localities, topography, hydrological and geological conditions, the mother nature of the soil and human factors. But the most direct factor is the gradual accumulation of saline content in the surface layer brought about by the rising of the underground water level. But our nation's natural conditions are complex and varied. The bioclimatic differences are great, the types of saline soils are many, the characteristics of saline accumulation are different, therefore measures must be suited to local circumstances, and different comprehensive measures of water conservancy, agricultural and biological measures must be used to treat the conditions.

In the paddy fields in valleys and mountain chains in our nation's southern hilly regions there is a relatively large proportion of winter paddy fields and mountain ridged fields. These paddy fields are all situated at higher elevations, the conditions of water sources are poor, sunshine is insufficient, therefore, at present, single season early rice or intermediate rice is commonly planted, and the fields are left as winter fallow land or for storing water. The multiple planting index is low, the productive potential has not been fully developed, and they need to be further improved and utilized.

Winter paddy fields are mainly distributed in the Yunnan-Guizhou Plateau and the Sichuan Basin. According to surveys, the winter paddy fields in Sichuan Province has reached 25 million mu, and Yunnan has about 3 million mu, constituting 48.8 and 25 percent respectively of the provinces' total area of paddy fields. These hilly regions are limited by landform conditions, there are only small diked ponds, the irrigation ability is low, there is no guarantee of water sources, and especially in winter, rain is scarce, spring drought occurs almost yearly, the amount of water used for spring planting is large, water conservancy facilities are poor, therefore fields are used to store water to assure cultivation of crops sown in spring and harvested in fall (paddy rice). Only half a year can be effectively utilized and during the remaining period the fields are used for storing water and kept in fallow. Land is not fully utilized and the yield is also low. Practice proves that building water conservancy projects in a big way to completely improve the conditions of irrigation is the prerequisite to reform winter paddy fields. For example, Shaodong

County in Hunan originally had an area of 380,000 mu of winter paddy fields, constituting 70 percent of the paddy fields of the entire county. After Liberation, farmland water conservancy construction was carried out in a big way, 85,053 mountain ponds were built, 132 reservoirs were built, 3,198 kilometers of ditches were dug, 984 reverse siphoning aqueducts were built, thus eliminating winter paddy fields, double season rice was poularized, and the one cropping a year system was completely changed. Thus, since 1971, per mu yield of food grains has surpassed the "guidelines" continuously for 4 years. Also according to the survey of the Tonghe Commune in Jianyang County in Sichuan, the commune had 5,400 mu of paddy fields. Of this, 90 percent was winter paddy fields. In recent years, as water conservancy facilities continued to be built, the conditions for irrigation improved day by day, the winter paddy fields were gradually changed to dual paddy and dryland fields. In 1973, 40 percent of the winter paddy fields of the entire commune had been utilized to plant wheat, average per mu yield was 334 jin, realizing double cropping of wheat and rice.

Mountain ridged fields (called mired fields, cold waterlogged fields at some places) are mainly distributed in the various provinces of broad hilly regions of the southeast. The areas are large. In individual regions, mountain ridged fields often occupy 50 to 70 percent of the area of cultivated land. These mountain ridged fields are easily affected by drought, sunshine is insufficient, the soil is cold, the water is cool, the bottom of the fields is muddy, the soil is infertile and the soil contains rusty water. For long periods, only one season of rice can be planted, the per mu yield was 300 to 400 jin, and they are the main low yielding fields of the locality that "drag behind."

Although mountain ridged fields have many shortcomings, they can be completely changed into high and stable yielding farmland as long as measures are appropriate. The poor and lower-middle peasants of the localities have created a lot of good experience, mainly engaging in basic farmland construction centered around water conservancy in a big way. The three ditches (drainage ditches, flood prevention ditches, irrigation ditches) were dug according to the characteristics of the topography, the three waters (cold water, rusty water, flood water) were drained, mouths of springs were removed, water from spring heads was led into the fields, irrigation by channeling water along furrows was changed to rotational irrigation. Green manure was planted, straw was returned to the fields, application of phosphorous fertilizers was increased and measures of mixing in sand, using non-native soil, and deep plowing were implemented. At the same time, controlling water and improving soil must be combined with the control of mountains, and the mountains, water, forests and farmland must be comprehensively treated. On the basis of greatly changing production conditions, single season rice must be changed to double season rice, and at some places, green manure, rape and wheat can be planted in winter to change one cropping a year into double cropping or triple cropping a year. For example, in Shunchang County in Fujian Province, mountain ridged fields of the entire county constituted 68 percent of the paddy fields. In the past, only single season rice was planted. Each year, food grains were not self-sufficient. But in 1969, efforts were begun to change the mountain ridged fields, and develop continuous cropping of rice. The sowing area constituted only two-thirds of the area of mountain

ridged fields, the multiple planting index correspondingly increased from 141 percent in 1965 to 236 percent in 1972, during the same period, the total yield of food grains almost doubled, the low yields of mountain ridged fields were completely eliminated.

In the area of 430,000 square kilometers of the loess plateau where loss of water and soil is serious, there are 116 counties and cities (banners) that are key locations with an area of 84.35 million mu of cultivated land, about 5.6 percent of the total area of cultivated land of the nation. Of the cultivated land, mountain slope land constitutes over 70 percent. Because of the mountains and hills, the many ditches, highlands, mountain ridges, small mountain peaks, steep slopes and quick streams, scarce vegetation, the soil of most places is exposed, rainfall is concentrated, there are many thunderstorms, therefore the loss of water and soil is very serious. The result of long periods of leaching has caused ever increasing destruction of cultivated land. The soil has become more and more infertile, damage by drought is serious. All "three materials" are lacking, productive conditions have worsened, agricultural production cannot increase, and the yield is far below the national average. After Liberation, the water and soil retention movement centered around farmland basic construction was carried out in a big way and some results have been obtained. Some advanced model counties such as Qugu, Zhengning and Wubao County emerged. But viewed as a whole, the area preliminarily controlled at present constitutes only over 10 percent of the total area suffering from leaching. The standards are not high, and the problem of loss of water and soil in the loess plateau is actually the problem of rational utilization of water and soil resources. To thoroughly change the inherited historical system of fallow rotation and to control loss of water and soil, the policy of "taking soil as the key link, engaging in comprehensive control of water, soil and forests to serve the development of agricultural production" must be insisted upon. The proportional relationship in the utilization of land of the three must be rationally arranged and an overall plan must be carried out according to the principle of unified arrangement of agriculture, forestry and animal husbandry so that land suitable for farming should be used for farming, land suitable for forestation should be used for forestation, land suitable for grazing should be used for grazing. At the same time, advanced planting, irrigation and fertilization measures must be used to improve the productive capability of the soil. The urgent task at present is to realize one, two, one (i.e., 1 mu of farmland, 2 mu of forest land, 1 mu of grazing land), carry out basic farmland construction centered around water and soil conservation in a big way, implement rotation planting of food grains and grass. These are effective measures to control the loss of water and soil.

3) Conserve the use of land and stop wasting land. Our nation's population is about one-fourth the world's total population. The area of cultivated land constitutes only 7 percent of the world's total area of cultivated land. The per capita average of land is only 1.6 mu (1976). Therefore, rational use of land, conservation of the use of land, stopping wastefulness are important to the rapid and profound development of our nation's agriculture and the sustained high speed development of the national economy. After Liberation, our nation used reclamation and encircling coastal land to make farmland and many such means

to expand the area of cultivated land. But as our nation's socialist construction develops prosperously, large scale water conservancy construction, transportation, industrial and mining construction and construction of cities and towns have occupied large amounts of cultivated land, thus gradually reducing the area of our nation's cultivated land. Analyzing the actual situation from the point of view of basic construction, all basic construction that occupies a lot of land is mostly concentrated in the eastern provinces and regions where our nation's economy is developed. These places are the concentrated regions of food grain production and economic crops of our nation, and they are also important industrial regions, the population is dense and there are more people and less land. In the future, as our nation's national economy rapidly develops and the population increases, the various basic construction projects of the nation must continue to occupy portions of cultivated land. Yet the conflict between the reduction of cultivated land and the objective requirements of rapid and profound progress in agriculture and large scale increases in food grain production and industrial raw materials will become more and more outstanding. Therefore, this conflict must be correctly handled and rationally solved. One is to open up new resources, exert efforts to expand the area of cultivated land and hasten reclamation of wasteland suitable for farming. The second is to conserve the use of land as much as possible, to use land rationally, to insist on stopping the practice of taking over a lot of land but using a little, taking over land early but using it later, taking over land but not using it and such practices of wasting land. The state must establish rules and regulations concerning land utilization, strengthen management, and under unified planning, unified arrangement, exert all efforts not to occupy cultivated land or to occupy less good land.

Section 2 Evaluation of the Resources in Waste Land Suitable for Farming and conditions of Reclamation

Table 3-6 Statistics of the Area of Waste Land Resources Suitable for Farming Throughout the Nation

Item / Region	Area 10,000 mu	Percentage of the area of waste land resources suitable for farming	Scope of distribution
National statistics	64,189	100	
Northeast	16,411	25.6	Liaoning, Jilin, Heilongjiang
Northwest and Nei Monggol	30,707	47.9	Xinjiang, Gansu, Qinghai, Ningxia, Nei Monggol
Southern Red and Yellow Earth regions	11,279	17.5	Jiangxi, Hunan, Guangdong, Guangxi, Yunnan, Guizhou, Hubei, Anhui, Zhejiang, Fujian, Sichuan
Coastal regions	1,614	2.5	Counties (cities) subsidiary to the provinces and cities of Liaoning, Hebei, Tianjin, Shandong, Jiangxu, Shanghai, Zhejiang, Fujian, Guangdong, Guangxi
Other provinces and regions	4,178	6.5	Hebei, Henan, Shaanxi, Shanxi, Jiangsu, Shandong, Tianjin, Xizang

Table 3-7 Statistics of the Resources of Waste Land Suitable for Farming in the Northeast and Areas of Their Classifications (Unit: 10,000 mu)

Item / Province	Total of the region: Area	Percentage of area of resources of waste land suitable for farming throughout entire region	First grade land	Second grade land	Third grade land	Fourth grade land
Region total	16,411	100	1,157	4,958	7,360	2,936
Heilongjiang	11,326	69.0	786	2,907	4,697	2,936
Jilin	2,894	17.6	264	1,149	1,481	--
Liaoning	2,191	13.4	107	902	1,182	--

Table 3-8 Statistics of the Area of Resources of Waste Land Suitable for Farming in the Northwest and Nei Monggol

Item / Province (region)	Area of resources of waste land suitable for farming (10,000 mu)	Percentage of the area of resources of waste land suitable for farming throughout the region
Xinjiang	17,464	56.8
Gansu	5,609	18.3
Ningxia	1,728	5.6
Nei Monggol	5,238	17.5
Qinghai	668	1.8
Total for the whole region	30,707	100

Table 3-9 Statistics of the Area of Resources of Waste Land Suitable for Farming in the Southern Red and Yellow Earth Regions (Unit: 10,000 mu)

Province	Area of resources of waste land suitable for farming	Percentage of the area of resources of waste land suitable for farming of the whole region
Total for the whole region	11,279	100
Jiangxi	1,100	9.8
Hunan	1,000	8.9
Guangdong	1,075	9.5
Guangxi	1,575	14.0
Yunnan	3,104	27.5
Guizhou	1,188	10.5
Hubei	820	7.2
Anhui	400	3.6
Zhejiang	260	2.3
Fujian	173	1.5
Sichuan	584	5.2

Table 3-10 Statistics of the Area of Resources of Reclaimable Coastal Spread in Coastal Regions

Regions \ Item	Regional limit	Area of coastal spread which can be encircled and reclaimed (10,000 mu)
Total area of coastal regions of the nation		1,614.5
Northern part	Liaoning Province	184.4
	Hebei Province	128.2
	Tianjin City	40.0
	Shandong Province	460.0
Subtotal		812.6
Central part	Jiangsu Province	145.1
	Shanghai City	20.0
	Zhejiang Province	240.0
Subtotal		405.1
Southern part	Fujian Province	203.5
	Guangdong Province	172.0
	Guangxi Zhuang Autonomous Region	21.3
Subtotal		396.8

[pp 119-120] [Excerpts]

Chapter IV Distribution of Food Grain Production in Our Nation and the Question Concerning Construction of Commercial Food Grain Bases

[pp 120-139] [Text]

Section 2 Development of Food Grain Production in Our Nation and Characteristics of Geographic Distribution

1. Development of the Level of Production of Food Grain Crops

After Liberation, our nation's production of food grains increased. In 1978, unit yield and total yield of food grains registered an increase of 137.5 and 182 percent over those of 1949. At the same time, our nation's farm village population increased 68 percent. The large scale increase in food grains has assured the basic needs of our nation's broad masses of people. We occupy 7 percent of the world's cultivated land and feed about one-fourth the world's population. This is a great achievement in our nation's agricultural production of the past 30 years.

Our nation's production of food grain crops has increased rather quickly. From 1949 to 1974, our nation's yield of food grains increased a total of 128.5 percent, an average annual increase of 4.9 percent. During the same time, the total yield of the world's food grains increased only 93.1 percent, an annual average increase of 2.7 percent. This shows our nation's food grain production has developed relatively quickly. Especially since 1962, our nation's food grain production has basically realized bumper harvests or good harvests year after year. The regions of the middle and lower reaches of the Changjiang and the Pearl River Delta where the foundation for food grain production is good originally increased food grain production on a large scale and continued to increase production. The three provinces of Henan, Hebei and Shandong in the middle and lower reaches of the Yellow River which were in a situation of having to transfer southern grains to the north for a long period can now begin to basically provide food grains self-sufficiently as the level of food grain production increases year by year. This shows our nation's food grain production has entered into the stage of preliminary balanced development.

At present, our nation has already become the largest food grain producing nation in the world. Our nation's yield of rice, barley, millet and sweet potato and the total yield of food grains all rank first in the world. In 1973, the total yield of food grains of the world was 3,139,700,000,000 jin. Our nation constituted 16.8 percent. In the same year, the total production of grains of the world was 2,736,200,000,000 jin. Our nation constituted 15.4 percent. The total yield of rice of the world was 641.4 billion jin. Our nation constituted 38 percent. In addition, our nation's production of corn, sorghum, potato and soybean ranked second in the world, and the production of wheat ranked third in the world.

But the unit area yield of food grain crops compared to the advanced international levels is still very low. For example, in 1973 the total average unit

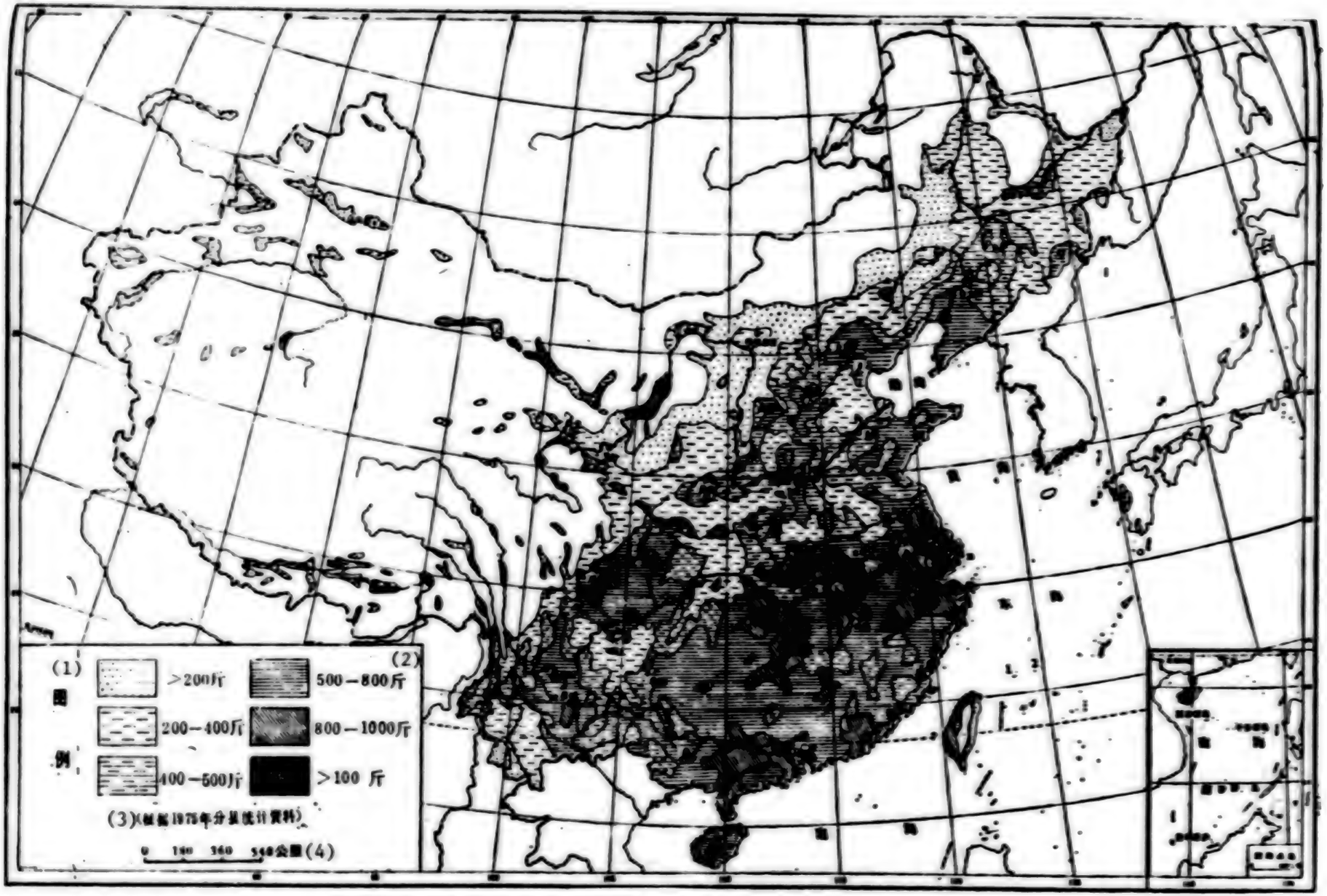


Figure 4-1 Average Per Mu Yields of Cultivated Land of Food Grains in the Nation

Key: (1) Legend
(2) Jin
(3) Based on county statistics of 1975
(4) Kilometers

yield of each food grain crop of our nation ranked 17th in the world; the unit yield of rice, our nation's major food grain crop variety, ranked 19th in the world. The unit yields of some other food grain crops such as wheat, corn and soybean were lower than the world's averages and they are far below the highest levels of the unit yields of each.

These all fully show that the potential for increasing unit yields of food grains in our nation is very great. At present, our nation has basically solved the problem of feeding the nation's people, but our nation's level of utilizing food grains is very low and the problem of food grain production has not been completely solved. Therefore, greatly developing the production of food grains is still a serious task on the battlefront of agricultural production in our nation.

Table 4-1 Ranking of Our Nation's Food Grain Production in the World (1973)

Crops	World's total yield (100 million jin)	Major producing nation	Percentage of world's total yield	Our nation's rank in the world	Percentage of world's total yield
Food crops total	31,397	China	16.8	First	16.8
Grains total	27,362	China	15.4	First	15.4
Paddy rice	6,414	China	38.0	First	38.0
Wheat	7,540	USSR	33.6	Third	9.3
Corn	6,225	USA	45.9	Second	12.4
Sorghum	1,034	USA	46.1	Second	20.7
Soybean	1,256	USA	67.7	Second	13.3

Table 4-2 Unit Yields of Sowing Areas of Food Grains of Our Nation and the World (1973)

Crops	Nation with highest unit yield	(jin/mu)	World's average unit yield (jin/mu)	Our nation's average unit yield(jin/mu)	Our nation's rank in the world
Food crops average	Japan	704	241	292	17th
Grains average	Japan	757	252	316	19th
Paddy rice	Spain	838	291	463	19th
Wheat	Holland	701	226	178	34th
Corn	New Zealand	1041	375	311	9th
Sorghum	France	582	162	272	11th
Soybean	Canada	278	189	151	16th

2. Characteristics and Change in the Geographic Distributionn of Major Food Grain Crops

Our nation's production of food grain crops is characterized by a large need, diverse varieties and broad range of adaptability. Therefore, reflected in geographical distribution, this is characterized by a wide and general distribution. But because of the different demands of various crops upon the ecological environment, and because our nation is expansive, our nation's natural conditions are complex, our nation has superior conditions that are suitable for the growth of many types of crops. Therefore, our nation's distribution of food grain crops is also characterized by relative concentration. Viewed from the basic characteristics of the distribution of food grain crops in our nation at present, they are:

1) The broad region of the south, east of the Qinghai-Xizang Plateau and south of Qinling and Hui River, mainly produces rice in rotation with winter wheat, winter rape, winter sweet potato and winter green manure and summer corn as multiple plantings.

2) Regions north of Qinling and Hui River, the plains of the Yellow, Hui and Hai rivers, provinces and regions of the northwest, western Nei Monggol and northern part of the northeast, mainly plant wheat. In the winter wheat regions to the south, wheat is planted in rotation mainly with summer corn, summer millet, summer soybean (or mung bean). In the spring wheat regions to the north, wheat is planted in rotation mainly with cereal grain, millet, potatoes, corn and peas.

3) Most regions of the three provinces of the northeast plant mainly corn, soybean, millet, sorghum in rotation with wheat.

4) The high and cold mountain regions of the western part of the Qinghai-Xizang Plateau mainly plant naked barley, peas, spring wheat, and rotation of cropping and fallow land is practiced.

Based on the actual situation of each locality, the rational distribution of food grain crops involves suiting measures to local circumstances according to the biological characteristics of each food grain crop, fully and rationally utilizing the various water and heat conditions to rationally combine need and possibility, utilize land and nurture land, food grain crops and economic crops, and to manage the relationship among various types of food grain crops, to establish a rational proportional relationship, to realize the goal of continually and effectively increasing food grain production and satisfy the ever increasing and diversifying needs of the people for food grains based on the needs of the development of the national economy. Now, the characteristics of distribution of our nation's major food grain crops are described separately below.

(1) Rice

Our nation is the highest rice producing nation in the world. In 1973, the area and yield were 26 and 38 percent of the world's, respectively. Rice

ranks first in the nation's food grain production and the people's consumption. In 1978, the planting area of rice constituted 22.9 percent of the total sowing area of the nation's food grain crops and the yield constituted 44.9 percent of the nation's total yield of food grains.

Rice is hygrophilous. During its growth period, there must be a sufficient supply of water. The total need for water is about 2 to 4 times that of dry-land food grains. The need for water of rice planted in the north is far greater than that in the south. Therefore, our nation's paddy rice is mainly distributed in the south where there is more rain and in northern regions where irrigation conditions are good. At the same time, paddy rice is also thermophilous. Low temperatures hinder germination and are also unfavorable to fruiting. The lowest temperatures required for germination of paddy rice are 10°C to 12°C. The temperatures for fruiting are 20°C to 25°C. These are two boundary index temperatures that determine paddy rice production. Except for a few high and cold regions in our nation, spring temperatures rise quickly in most places, temperatures are generally high in summer, the drop in temperature in autumn at each locality is different. In general, based on the requirements of different paddy rice varieties for heat resources (cumulative temperatures), most places can satisfy the needs for one cropping to two croppings (and triple croppings at a few places). Therefore, rice is widely distributed in our nation, from the tropical Hainan Island in the south, to the cold Temperate Zone of Huma County in Heilongjiang in the north, east to Taiwan and west to Xinjiang, from the low marshlands and the tidal fields of the coastal regions to the mountain fields in the mountain areas in northern Yunnan at 2,700 meters above sea level. Rice is distributed everywhere except individual high and cold regions or arid regions that lack water sources. But according to the combined characteristics of heat and water, the distribution of rice is characterized by concentration and abundance in the south and scarcity and dispersion in the north, as described below:

1. Southern Concentrated Rice Producing Regions

The area and yield of rice fields in the Changjiang river valley, south China and the provinces of the southwest south of the line from Qinling to the Hui River constitute 90 percent of the national total. In the southern regions, the alluvial plains, terrace land, plains banking lakes, coastal plains, flat land and the basins between mountains on the Yunnan-Guizhou Plateau and the terrace fields in the broad hilly and low mountain regions are the central rice producing regions. They can be divided according to the system of cultivation and types of varieties:

(1) South China double season xian rice region: This includes the four provinces of Taiwan, Fujian, Guangdong and Guangxi south of Nanling. It belongs to our nation's wet and damp regions of the Subtropical and Tropical Zones. It is the double season rice producing region of mainly xian rice. It has the richest water and heat resources, the longest growth season and the greatest potential for multiple planting of paddy rice of the nation. In 1978, the area and yield constituted 25.9 and 21.5 percent of the nation's rice (not including figures for Taiwan). Rice is most concentrated in the Pearl River Delta,

Hanjiang Delta in Guangdong, the lower reaches of Minjiang and Jiulongjiang in Fujian, the two banks of Xijiang in Guangxi and the western plains of Taiwan. The sowing area of paddy rice generally constitutes over 70 percent of the total sowing area of food grains. The second most concentrated area is the mountain region and river valleys and basins of the hilly region. Central Guangdong, Wanning, Lingshui and Yaxian in eastern Hainan Island and Zhanxian in northern Hainan Island are our nation's regions of triple season continuous planting of rice. In some places in this region, there are double season interplanting of rice, mixed planting of rice and regenerative rice. At some places in southern Guangdong Province, triple season rice and winter wheat have been test planted and four harvests a year have been successful. It can be see that the productive potential in the South China rice region is very great.

(2) The single and double season rice region of the middle and lower reaches of the Changjiang: Jiangsu, Zhejiang, Anhui, Jiangxi, Hunan, Hubei provinces and Shanghai City north of Nanling and south of Hui River and Qinling, southern Henan and southern Shaanxi are the single and double season rice cultivation regions. In past years, the planting area and yield of paddy rice constituted about two-thirds and nearly 70 percent of the total sowing area and total yield of paddy rice of the nation. This region is our nation's largest paddy rice producing region. Paddy rice cultivation is most concentrated in Jiangsu, Zhejiang, Shanghai Changjiang Delta, Taihu Plain, the lowland plain of Lixiahe in central Jiangsu, Yanjiang Plain in Anhui, Boyanghu Plain in Jiangxi, Dongtinghu Plain in Hunan, and Jianghan Plain in Hubei. These regions along rivers and lakes have an abundance of water sources because of the many river networks, irrigation is developed, management of planting is relatively refined, irrigation is developed, management of planting is relatively refined, fertilizers are generally sufficient, human and animal labor forces are good, and the region is the nation's high yielding region of rice. In the past, the region planted mainly single season xian rice. In recent years, the area of double season rice greatly developed due to the development of farmland basic construction, continuous improvement of the conditions of water and fertilizers, the popularization of early maturing and high yielding varieties, and improvement of techniques of cultivation. In 1978, the area of double season rice of the entire region reached about 110 million mu, constituting 60.8 percent of the area of double season rice of the nation, becoming our nation's major centralized double season rice producing region.

(3) The paddy rice region of the Yunnan-Guizhou Plateau: This region includes the two provinces of Yunnan and Guizhou. In 1978, the sowing area of rice constituted 5.3 percent of the national total. Because this region's topography is complex, differences in elevation are vast, vertical climatic changes are distinct, the varieties of rice are also visibly vertically distributed. For example, geng rice is mostly planted in the high mountain areas at about 2,000 meters above sea level. At 1,500 meters, geng rice and xian rice are mixed. In the low mountains, hilly regions and flat land below 1,200 meters, mostly xian rice is planted. In the past, single season rice production was the main crop, but in recent years, some double season rice has been developed in the flat land regions of river valleys.

(4) The paddy rice region of the hilly regions of the Sichuan Basin: Mainly of single season intermediate rice, the sowing area and yield constitute about 70 and 75 percent. Rice is mainly distributed in the shallow hills of the western plains of Sichuan, along the banks of the Changjiang in southeastern Sichuan, the hilly regions of the lower reaches of Minjiang, Tuojiang and Jialingjiang, and the Anning River Valley region in the Xichang area. The upper limit of distribution can generally reach 1,400 to 1,500 meters in the hilly regions surrounding the basin while in the Xichang and Liangshan regions in the west, it can reach 2,400 to 2,500 meters, forming our nation's highest region of paddy rice distribution of the nation. The development of double season rice in Sichuan Province is not great because of the many conditions of water, fertilizer, labor force, varieties and techniques of cultivation. In 1978, the sowing area and yield were only 7.8 and 3.2 percent of the province's total rice production. It is a province with a relatively small area of double season rice and relatively low yield among the southern provinces and regions of our nation. The distribution is mainly concentrated in the western plains of Sichuan and the hilly regions of southeastern Sichuan. As the above conditions are gradually improved, the area of double season rice in this region will expand.

2. Northern Scattered Rice Producing Region

The region north of Qinling and Hui River including the broad regions of the northeast, north China and the northwest is our nation's single season geng rice region. The sowing area and the total yield of rice are all very small. In 1975, they each constituted 2.67 and 3.13 percent of the national total. The distribution of rice is characterized by widespread scattering and small concentration. In 1975, the "three northern" regions had a total of 848 counties, cities and banners. Of these, 582 localities planted rice, constituting 68.6 percent. The areas of plantings in each county varied from several dozen mu to several hundred thousand mu. Rice is planted mostly in the northeast followed by north China and rice plantings are scattered in the northwest.

(1) Northeast early maturing geng rice region: In 1978, the area of rice in the three provinces of Liaoning, Jilin and Heilongjiang was 13.291 million mu, constituting 43.4 percent of the total area of rice in the north, mainly distributed in the plains of the middle and lower reaches of the Liao River in Liaoning Province and the basins between mountains in the northeastern part, the Yanbian Korean Autonomous Prefecture, the central Songhuajiang Plain, the western Xiliao River Plain, the plains of the valley of the mid-mountain regions of Mudanjiang and the regions along the Heihe. The Liaohe valley has developed the fastest. The growth season in the northeast is short and all the rice is single season early geng rice. The system of summer rice and winter fallow is practiced.

(2) The north China single season geng rice region: This includes Tianjin City and the provinces of Hebei, Henan, Shandong, Shanxi, the Huibei region of Jiangsu and Anhui provinces. Rice is mainly distributed in the lowland plains of the lower reaches of the Hai River, the lowlands along the banks of the Shai River, Ru River, Yin River and Hong River in Henan, the lowlands on

the banks of the lakes in the Heze and Jining regions and Linyi region in Shandong, the basins of the river valley of Yuci and Taiyuan in Shanxi, the Hubei region in Jiangsu and Anhui, mostly the lowlands next to lakes and rivers, alkaline and saline soils and low yielding soil regions. Planting paddy rice is beneficial to improving the soil and increasing the yield of food grains. In the future, as water from the south is diverted to the north, there is a relatively great potential for changing dryland fields to paddy fields.

(3) The northwest arid rice region: This region includes the Yinchuan Plain in Ningxia, the western part of the Hexi Corridor in Gansu, the oases of Urumchi-Manasi, Aksu, Kashgar, Kucha, and Shache. All are irrigated artificially and all the rice varieties are early maturing varieties that resist drought.

In addition, paddy rice is scattered in the low and gentle river valleys in the high and cold Qinghai-Xizang region, such as the valley of the lower reaches of Huangshui in Qinghai, the Guide area in the Yellow River valley and Motuo in the valley of the Yalu Tsangpo River and Chayu in the southeast.

Since Liberation, our nation's paddy rice production and distribution has undergone great change. Many regions without rice have become new rice regions. Scattered rice regions have developed into large expanses. Single season rice of one cropping has become double cropping, and wheat or double cropping of rice and wheat (rape, green manure) has become triple cropping of double season rice. These have greatly increased the area of multiple planting and the yield of food grains. For example, in the Huibei region of Jiangsu, Anhui and Henan provinces, the sowing area of rice in 1950 was only 1.368 million mu, the total yield of rice constituted only 0.6 percent of the total yield of food grains of the time. But in 1973, the area of rice had expanded by 5.2 times and the total yield had increased 38.5 times over that in 1950.

The sowing area of double season rice had also continuously expanded. In 1978, the nation's sowing area of double season rice had already constituted 47.4 percent of the nation's area of paddy fields. The elevation of planting had already reached 2,420 meters above sea level in the Yuanjiang valley in Yunnan. Test planting in latitude had also been successful up to Zhengzhou in Henan and Xuzhou in northern Jiangsu. In the 13 major rice producing provinces and regions in the south in 1978, the area of rice has increased over onefold over that in 1956. Many regions that mainly planted single season rice in the past are now dominated by doubleseason rice. For example, in 1978, the area of double season rice in the 10 provinces and cities (wards) of Guangdong and Guangxi, Hunan and Hubei, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shanghai constituted 64.7 percent of the area of paddy fields. The area of the triple cropping system of double season rice in the Suzhou area in Jiangsu Province has already reached 80 percent of the area of rice fields. The area of the triple cropping system of double season rice in the 10 counties in the Shanghai suburbs has already reached over 70 percent of the area of rice fields. Expanding the system of double season rice or triple cropping of double season rice is an important way to fully utilize such natural conditions as light, heat,

water and soil and to increase the yield of food grains. All possible localities should actively create conditions to further develop these systems. But the situation at some places where conditions were neglected, thus resulting in reduced yields, or where increases in yield could not be continued or where yields were increased but harvest did not increase must be taken into consideration. Looking at the regions throughout the nation that are developing the system of triple cropping of double season rice or double season rice, most of the localities produce high yields of early (rice) and low yields of late (rice), or high yields of intermediate (early rice) and low yields at both ends (late rice, spring food grain crop), and the total yields fluctuate and are not stable enough. Therefore, fiercely grasping the weak links, increasing unit yields, firming up the area of reforming the planting system, striving towards high yields for each season and sustaining high yields are the major directions to develop double season rice and expand the triple cropping season of double season rice at present.

In recent years, all places of our nation have launched studies in the utilization of paddy rice heterosis and some xian type hybrid paddy rice varieties have been successfully bred. In 1975, double season early rice, intermediate rice and double season late rice have been planted over more than 5,600 mu in over 10 provinces, cities and autonomous regions of Guangxi, Jiangxi, Hunan and Guangdong. Under generally better cultivation conditions, the per mu yield of large areas of hybrid rice has all been over 1,000 jin. Some yields have reached above 1,200 jin and even above 1,500 jin, 20 to 30 percent increases in yield over the dominant varieties of the locality, and some increases are even in multiples. This is a new direction in reforming paddy rice varieties and increasing the yields of rice. It is being popularized actively throughout the nation. This shows that our nation's distribution of paddy rice has developed to a new stage.

(2) Wheat

The sowing area of wheat constitutes one-fifth of the total sowing area of food grain crops and the yield constitutes one-seventh of the total yield of food grains. It is our nation's major food grain crop besides rice. Wheat constitutes over one-fourth of the average consumption of food grains in our nation. The consumption by the northern people is far greater than this figure. Since Liberation, our nation's wheat developed rapidly. In 1978, the sowing area of wheat throughout the nation and the total yield registered increases of 35.9 and 289.4 percent over those of 1949.

Wheat is a crop of the Temperate Zone. Its adaptability is strong. It can be planted in our nation's northern regions, southern regions, plains, in winter and spring. It can be harvested early in summer waterlogged regions to avoid disaster. It possesses a definite characteristic of stable yields and assured harvests. But the concentrated regions are mainly in the five provinces of Henan, Shandong, Hebei, Shaanxi and Shanxi north of Qinling and the Hui River. This region constitutes about 45.3 percent of the total [illegible] f wheat throughout the nation and produces 49.9 percent of the yield of wheat, followed by Anhui, Sichuan and Jiangsu.

There are many varieties of wheat. According to the differences of sowing periods, wheat can be divided into winter wheat and spring wheat. Our nation mainly plants winter wheat. The sowing area and the yield constitute 82.3 and over 87 percent respectively.

According to the differences in the planting systems, methods of cultivation and varieties, our nation's wheat can be divided into three regional types:

1. Spring Wheat Regions

Spring wheat is sown in over half of our nation's provinces. But it is mainly distributed north of the Great Wall, west of Minshan, west of Daxueshan, including the provinces of the northeast, Nei Monggol, Ningxia, Qinghai, Xizang, Xinjiang, most of Gansu, western Sichuan, some of the northern parts of the three provinces of Hebei, Shanxi, Shaanxi. The sowing area and the yield constitute 80 and over 78 percent of the national totals. Among these regions, Heilongjiang, Nei Monggol, Gansu and Xinjiang are the major producing regions. The northern spring wheat regions are characterized by the following: Most of the regions are situated in the arid and cold or high and cold zones, winter is extremely cold and winter wheat cannot safely winter, the frostless period is short, frequently less than 200 days, the system of cultivation is mostly one cropping a year, thus forming our nation's most important spring wheat region.

In recent years, our nation's spring wheat production realized two great developments. One is in yield. Our nation's northern regions have bred and cultivated some superior varieties of spring wheat that have strong resistance to adversity, wide adaptability, high bumper harvest characteristics. Now they have been popularized everywhere and they have realized visible increases in yield. Some average per mu yields can reach above 1,000 jin. For example, in 1973, the Nuomuhong Farm in the Tsaidam Basin has 3.4 mu of spring wheat that produced a per mu yield of 1,585 jin, creating a world record. The second is a great change in the distribution of the producing regions. In recent years, our nation's spring wheat is moving from north to south. This has served favorably in the rational improvement of the planting system and the increase in food grain production. This is the success in companion planting or transplanting and multiple planting of spring wheat and corn, sorghum, millet and paddy rice in the one cropping a year region of corn, sorghum, millet on the two sides of the Great Wall. Conditions for double bumper harvests of food grains and cotton were created using companion cropping of high yielding early maturing spring wheat and spring wheat and cotton in the North China Plain which is the concentrated winter wheat and cotton producing region and where increase in food grain production was affected because some crops such as cotton matured late and crop opening was late, delaying the sowing time of winter wheat. This is a great development in the distribution of spring wheat production in our nation.

2. Northern Winter Wheat Regions

They are mainly south of the Great Wall, east of Liupanshan, north of Qinling and Hui River, including Shandong, most of Henan, Hebei, Shanxi, Shaanxi, eastern and southern Gansu, northern Jiangsu, northern Anhui. The sowing area

and the yield of winter wheat both constitute over two-thirds of the national totals. Generally, double cropping a year and triple cropping in 2 years are practiced. Winter wheat is a wintering crop. It does not conflict much with the planting of other food grain crops. The area of winter fallow land can be reduced, the area of multiple planting can be expanded, and food grain production can be increased. Therefore, as the production conditions gradually improve, the planting area of our nation's winter wheat has expanded continuously since Liberation. At present, the distribution of our nation's winter wheat in the east has already crossed the Great Wall and advanced towards the regions of 47°N (test planting has been successful in Nahe and the Keshan areas). In the west, winter wheat is also planted in large areas in Xinjiang and the Hexi Corridor in Gansu. In the east, the area of planting of winter wheat has already surpassed that of spring wheat. In elevation, winter wheat has been planted at the Pengbo Farm in Lhasa on the Qinghai-Xizang Plateau at an elevation of 4,100 meters above sea level. This farm began to plant winter wheat over large areas beginning in 1971. Since then, the average per mu yields for 4 consecutive years were all above 400 jin. In 1973, the farm had 11.6 mu of land, the average per mu yield was 1,339 jin, creating the highest record of winter wheat in our nation. In 1974, that farm's wheat area had already expanded to 40,000 mu, constituting 60 percent of the area of food grain crops.

3. Southern Winter Wheat Regions

They are the regions south of Qinling and Hui River, east of Zheduoshan, including Zhejiang, Fujian, Jiangxi, Guangdong, Guangxi, Hunan, Hubei, Guizhou, Yunnan, Sichuan, most of Jiangsu, Anhui, and southern Henan. The planting area and total yield of winter wheat constitute about 30 percent of the national totals. Because the people in these regions consume mainly rice, the commercial products percentage of wheat is very high. These regions are our nation's important commercial wheat producing regions. Because a lot of rice is planted in the southern winter wheat region, in the past, many places habitually emphasized autumn and neglected summer. Planting of wheat was not refined and the yields were low. Some places believed that "planting wheat means a loss of rice," therefore they would rather leave the land as winter fallow land than to plant wheat. This situation has greatly changed as the production conditions improved. for example, in 1978, the sowing area and yield of winter wheat increased 154.6 and 130 percent over 1952 respectively.

(3) Dryland Food Grain Crops

Our nation has many varieties of dryland crops, mainly corn, sorghum, millet, cereal, barley, oats, buckwheat, peas, broad beans, mung bean. Dryland crops are generally widely distributed and have strong adaptability. They can fully utilize various natural conditions and their growth periods are relatively short. They can be rotated with various other crops. They serve greatly in increasing the rate of utilization of land and increasing the total yield of food grains. They occupy a very important place in our nation's food grain production. At the same time, the varieties of dryland crops are many, they have many uses in production and the life of the people. They are not only important foods and supplementary foods of the people, but are also necessary feed for developing the livestock industry and industrial raw materials.

In the composition of dryland crops, corn, millet and sorghum are the most common: Their distribution of production is as follows:

1. Corn

Corn is our nation's high yielding dryland crop. Its use is wide and the potential for increased production is great. Its position among our nation's food grain crops is second only to rice, wheat, potato. In 1978, the sowing area of corn constituted 52.2 percent of the total sowing area of dryland food grain crops. Its yield constituted 66.5 percent of the total yield. Unit yield was one-third higher than the average yield of dryland food grain crops. In 1971, the planting area of high yielding hybrid corn throughout the nation reached over 67.2 million mu, constituting one-third of the total area of corn throughout the nation. Unit yield was 25 to 30 percent higher than that of ordinary corn, and even one time higher. The planting area of corn in our nation before Liberation was about 100 million mu. After Liberation this developed greatly. In 1975, it had already developed to 299 million mu, an increase of 1.9 times over that before Liberation. The yield also increased visibly. In 1975 unit yield and total yield increased 109 and 196 percent over those before Liberation respectively.

Corn likes a warm and damp climate. The area of distribution has an average annual rainfall of between 800 and 1,500 millimeters. The average monthly rainfall during the growth period should be 100 millimeters. The regions with an annual rainfall of less than 350 millimeters require irrigation. But during the flowering and fruiting periods, the weather should be dry and hot. The late maturing varieties need 150 days to mature. The early maturing varieties need 80 days to mature. Therefore, it can be planted at high latitudes and high elevations where the growth period is short. For example, corn is planted on the northern plateau of Yunnan at an elevation above 3,000 meters above sea level in our nation. But the concentrated planting regions of corn in our nation are Daxinganling in Heilongjiang, southern Liaoning, northern Hebei, southeast Shanxi, southern Shaanxi, northern Hubei, western Henan, areas around the Sichuan Basin, western Guizhou and Guangxi, southwest Yunnan, forming a semi-mountainous and hilly zone extending from the northeast to the southwest, covering 12 provinces and regions of the north and south. The area constitutes 78 percent of the total sowing area of corn of the nation. More cornfields are in the northeast than in the southwest. This distribution characteristic of corn is mainly because paddy rice, wheat and economic crops are planted in most of the plains (except north China), and at the same time, the yield of corn is not as high and stable as that of paddy rice and potato in the southeast hilly regions where annual rainfall surpasses 1,500 millimeters. In the northwest regions of dry and arid climates where the annual rainfall is generally below 350 millimeters, except for the river valleys and river flat lands where conditions of irrigation are good or high and cold overcast and damp mountain regions, corn does not produce stable and assured harvests in the rest of the regions as spring wheat, millet, cereal grains and sorghum.

2. Sorghum

Our nation was the finest nation in the world to cultivate sorghum. In 1978, the yield of sorghum constituted 9.04 percent of the total production of dryland food grains, second only to corn and millet. In 1971, the planting area of hybrid sorghum throughout the nation reached over 22.8 million mu, constituting one-fifth of the total area of sorghum. Unit yield is higher than that of ordinary sorghum by 30 to 40 percent, even by multiples, reaching as high as 2,000 jin.

Sorghum has a strong adaptability to natural conditions, its resistance to drought is similar to that of millet, its ability to resist waterlogging surpasses all of the dryland crops. It can produce relatively stable yields in places where conditions are poor. Therefore, it is more concentrated in the mountain regions of the northern and southwestern hilly mountain areas where the soil is damp and low, where there are saline and alkaline soils, where the soil is heavy, lowland regions of plains, the south central part of the northeast, and the lower reaches of the Yellow River and the Jianghui Plain which are easily flooded. The sowing area of sorghum is mostly in the three provinces of the northeast, constituting 40.5 percent of the nation's total sowing area of sorghum, and 8.7 percent of the area of food grain crops of the northeast. The quality of products and unit yields are both the highest in the nation, followed by Shandong, Shanxi, Henan, Hebei provinces. Sorghum is planted at scattered places in the south and it does not occupy an important place.

3. Millet

Our nation produces the most millet in the world. The growth period of millet is shorter than that of corn, from 70 to 120 days. The amount of water needed by millet is half that of wheat. Therefore, millet is a more suitable crop that can produce stable yields and assured harvests in north China, the northwest, the northeast and Nei Monggol where the growth season is shorter, the climate is dry, and rainfall is not stable enough. It is mainly distributed in the region from north of the Hui River to the Keshan region in Heilongjiang, including the North China Plain, the loess plateau, the Songliao Plain in the northeast and the western regions of Nei Monggol. Millet is a good intertilled crop. It can combine well with other winter crops in rotation. Its early maturing varieties can be planted in multiple plantings after harvesting winter wheat in regions of double cropping a year or triple cropping in 2 years. This will increase the rate of land utilization. In regions of one cropping a year, it is a good forecrop of wheat, potatoes and cotton. The stalks of millet are also superior feed for large livestock. Therefore the economic significance of millet is great. But in the past, some regions did not plant millet carefully and the yield was low, and millet was considered a low yielding crop. Therefore the area of planting was suppressed. This was very unfavorable to suiting measures to circumstances and to increase food grain production. In recent years, a group of typical commune brigades that have planted millet in large areas and have produced a large quantity of bumper harvests have emerged because of the change in the conditions of production and the full exploitation of the potential for increasing production. The per mu yield reached the "guideline" and even surpassed

1,000 jin. Facts prove millet can produce high yields when sown in spring and can also produce high yields when sown in summer.

(4) Potato Crops

Our nation's main potato crop is the sweet potato, constituting 80 percent of the sowing area of potatoes, followed by Irish potatoes. In addition, there is also a small amount of cassava.

Potato crops have a strong adaptability, and they can be planted in the south, north, mountain regions and plains. They do not require much care, their yields are high and stable, they can serve as food and are also good feed and industrial raw materials. After Liberation the production of potato crops developed rapidly. In 1978, the planting area of potato crops of the nation reached 176.943 million mu, an increase of 81.2 percent over that in 1949. The total yield increased 210 percent over that in 1949. Unit yield is higher than the average unit yield of food grains of the nation by 27.4 percent. Among the various food grain crops, they are second only to paddy rice. Appropriately expanding the planting of potato crops serves importantly in increasing the production of food grains.

1. Sweet Potato

Sweet potato is tolerant to infertile land, drought, acidity and alkalinity. It has a strong resistance to wind and it is affected by few diseases and insect pests. The yield is relatively high and stable. Therefore it is widely emphasized. Especially in regions with a shortage of food grains, cultivating a definite area of sweet potato serves greatly in solving the problem of food grains. At the same time, sweet potato is a good vanguard crop to improve and utilize red earth wasteland in the south. In the north, it can be planted in slightly alkaline land, therefore, it has important significance in rational utilization of land and increasing the production of food grains. Our nation's sweet potato is distributed widely, mainly concentrated in the Pearl River valley, middle and lower reaches of the Changjiang, Sichuan Basin and the lower reaches of the Yellow River, or regions where there are more people and the level of production of food grains is low, food is scarce, such as the region of the Yellow, Hui and Hai rivers of the past or regions where there is a lot of dryland and the yield of rice is small, such as the hilly mountain regions in south China and the southwest.

2. Irish Potato

Irish potato is suitable for cool environments and does not tolerate high temperatures. Its growth season is short, it matures fast (early maturing varieties mature in 70 to 90 days). It is suitable for cultivation in regions of high latitudes and at high elevations. It is a high yielding crop that can avoid waterlogging and can produce sure harvests in regions of internal waterlogging and where rain is abundant in summer and autumn. It is also an important vegetable crop in suburban agriculture around cities.

Irish potato is cultivated in all provinces of the nation, but mostly concentrated in the northeast, Nei Monggol and the northwest.

3. Cassava

Cassava originated in South America. It ranks with sweet potato and Irish potato as the three major potato crops of the world. It has been grown in our nation for over 100 years. In recent years, the area of cultivation has been about 7 million to 8 million mu, mainly distributed in the dryland slopes in Guangdong and Guangxi. Besides using it as food, it is an important raw material of starch for industrial use. Fresh leaves of cassava can be used in sericulture and pisciculture, and after drying they can be used as feed.

(5) Soybeans

Soybean is our nation's major legume food crop and also an important oil bearing crop. It is widely useful and its price is high. But in the past, because of careless cultivation and management, less fertilizers were applied and because the varieties degenerated, the increase in unit yield was slow, causing the planting area and the total yield to drop.

Soybean is a thermophilous crop. It is suitable for planting in the Temperate Zone. Summer temperatures should be high. Especially during the seedling period, more water is needed, and during the flowering period, it should be dry and there should be less rain. During the pod forming period, it should be damp, and at time of harvest, it should be dry. Therefore, the weather in our nation's northern regions is more suitable. Soybean does not require strict soil conditions, and the plant increases the fertility of the soil. Therefore it is suitable for rotation with wheat and cotton that exhaust the fertility of land more.

Our nation's soybeans can be divided into spring sown, autumn sown and summer sown soybeans according to the planting seasons. In the system of cultivation, it can be planted singly, interplanted, mixed planted, companion planted and double cropped. The area of distribution covers the entire nation. The Songliao Plain in the northeast and the plain of the Yellow and Hui rivers in north China are the two regions of concentrated production of the nation. In 1978, the three provinces of Liaoning, Jilin and Heilongjiang in the northeast had a sowing area of soybean that constituted 38.8 percent of the nation's total sowing area of soybeans, the yield constituted 44.7 percent of the nation's total, the average unit yield was 163 jin, slightly higher than the national average. Soybean is concentrated mainly in the plains on the 2 sides of the Shenyang-Harbin-Keshan Railroad extending 100 to 200 kilometers from south to north. In this region, one season of soybean is produced a year, rotated with wheat, millet and sorghum. [illegible] are interplanted or mixed planted with corn. The quality of soybean [illegible] egion is superior, the percentage of commercial products is high, and [illegible] region is our nation's greatest commercial soybean production base. Our nation's second concentrated region of soybean production is Shandong, Henan, Hebei, Shaanxi, Shanxi in the north and northern Jiangsu and northern Anhui. In 1978, the sowing area constituted about 36.6 percent of the nation's total sowing area of soybeans, the yield constituted 30.3 percent of the nation's total, the average unit yield was 117 jin. The sowing area of soybean in the region of the North China Plain east of Jingguanglu, south of

Shidelu and north of the Hui River generally constitutes over 10 percent of the total sowing area of local agricultural crops. Soybean is rotated with winter wheat in crop exchange, mostly single cropping in summer. It is mainly used as an important food for the people of this region but the percentage of commercial products is not high.

The provinces south of Qinling and Hui River, the middle and lower reaches of the Changjiang and south China are summer sown and autumn sown soybean regions, and the production regions are basically scattered. The oil bearing crops of these regions are mainly rape and peanuts. Management of soybeans is generally less refined and the yield is low. The four provinces and regions of Ningxia, Gansu, Qinghai and Xinjiang in the northwest and western Nei Monggol all belong to the spring sown soybean region. The planting area is small and scattered. The yield is small, and soybean is mostly used for consumption as a supplementary food.

Soybean is an important oil bearing and food crop. Its nutritional value is high, its ability to nurture land is good. Greatly increasing the unit yield and retaining or appropriately expanding the planting area are very meaningful to the national economy.

3. Characteristics and Change in Regional Combinations of Food Grain Crops

Regional combinations of food grain crops include two aspects: one is the proportional relationship between the sowing area and the yield of various food grain crops; the second is the various major rotational planting systems of various crops that have already been formed in a definite region. Since the founding of the nation, as the conditions of production of the various regions improve, and to satisfy the various needs of the national economy, our nation's combinations of the regions of food grain crops have undergone relatively great changes.

(1) Changes in the Sowing Area of Food Grain Crops and the Structure of Yields

Analysis of the table of the changes in the total yield and in the areas of the major food grain crops as a percentage of the total sowing area of food grain crops for different years shows:

1) Rice and wheat are our nation's two major fine grains, their proportion has always been dominant, and the general trend is increasing. On the contrary, the proportion of millet, sorghum, secondary miscellaneous grains and beans has dropped (see Table 4-4). In 1978, the sowing area of wheat and rice increased 34.3 percent over that in 1949, and the yield increased 205.3 percent over that in 1949. This is a reflection of the continuous improvement in the level of production of our nation's food grains and the standard of living of the people.

2) The increases of high yielding crops of corn and potato among the high yield dryland food grains are rapid, and the rapidity of the increases in yield surpassed the rate of increase in area. In 1978, the area of the two crops

Table 4-3 Table of the Changes in the Total Yield and in the Areas of the Major Food Grain Crops as a Percentage of the Total Sowing Area of Food Grain Crops*

Item	Percentage / Year	1949	1952	1957	1965	1978
Total of food grain crops	Sowing area	100	100	100	100	100
	Total yield	100	100	100	100	100
Rice	Sowing area	25.29	22.9	24.1	23.3	28.5
	Total yield	43.0	41.7	44.5	45.0	44.0
Wheat	Sowing area	21.16	20.0	20.6	19.3	24.1
	Total yield	12.2	11.1	12.1	13.0	17.3
Dryland food crops	Sowing area	46.64	40.7	38.0	42.1	31.7
	Total yield	31.6	31.4	27.0	28.6	26.0
Including: Corn	Sowing area	10.1	10.1	11.2	--	16.6
	Total yield	10.4	10.3	11.0	--	17.8
Sorghum	Sowing area	--	7.5	5	--	2.9
	Total yield	--	6.8	3.9	--	2.6
Millet	Sowing area	--	7.9	6.3	--	3.5
	Total yield	--	7.1	4.4	--	2.1
Potato	Sowing area	6.89	7.0	7.8	8.7	9.8
	Total yield	8.7	9.9	11.2	10.2	10.2
Soybean	Sowing area	8.18	9.4	9.5	6.7	5.9
	Total yield	4.5	5.8	5.2	3.2	2.5

*This table does not include figures for Taiwan.

Table 4-4 Changes in the Proportion of the Area and Yield of Grains and Fine Grains Over the Years

Item	1949	1952	1957	1965	1978
Ratio of area (grains:fine grains)	57.1:42.9	57.1:42.9	50.5:49.4	57.5:42.5	47.4:52.6
Ratio of yield (grains:fine grains)	44.8:55.2	43.9:56.1	43.4:56.6	41.9:58.1	38.7:61.3

increased 49.4 percent over that in 1952, and the yields increased 164.3 percent. Greatly developing these two high yielding crops serves greatly to satisfy needs.

3) Although the area and yield of sorghum, millet, soybean and other food grains have increased and decreased over the years, the general trend is reduction. The area in 1978 showed a drop of 51.9 percent over that in 1952. The total sowing area of sorghum, millet and soybean in 1952 constituted 24.8 percent of the total sowing area of food grains. This dropped to 12.3 percent in 1978. Especially worth pointing out is that during these years, the planting area and yield of soybean has drastically dropped, unfavorable to developing production and satisfying the people's needs. This point has already been mentioned before. The situation should be changed.

(2) Changes in the Regional Combination of Various Crops

Analysis of Table 4-5 shows:

1) The sowing area of rice throughout the nation in 1978 showed an increase of 21.3 percent over that in 1952. The development of rice production has been rapid in north China, the northwest, and the northeast because of the development of water conservancy projects, especially the control of the Hui River, Hai River and Liao River, active reformation and utilization of lowlands, saline and alkaline lands, implementation of "changing dryland fields to paddy fields" or rotation of paddy and dryland crops. Comparison of 1978 and 1952 shows the increases in the three regions were respectively 46.9, 105 and 132.1 percent.

2) The sowing area of wheat in 1978 registered an increase of only 17 percent over that in 1952. Greater increases were registered in the northwest, south China, the southwest and the Qinghai-Xizang area. This is mainly due to the improvement of such conditions of production as water and fertilizers, or the utilization of winter paddy fields, expansion of winter plantings, increasing the production of fine grains and satisfying the needs. The north China region is our nation's main concentrated wheat producing region. In recent years, increasing the multiple planting indices was emphasized and the area of wheat also expanded.

3) Among the dryland food grains, the area of sorghum and millet decreased the most. The decreases were most visible in the north China and the central China regions that are the major producing regions, constituting 49 percent of the total decrease of the nation. This has affected the supply of feed grass, fuel and building materials in farm villages to varying degrees. In recent years, the northeast expanded production of rice, wheat and corn, resulting in a larger reduction of sorghum. Because of the continued improvement in the productive conditions of water and fertilizers in the "three northern" regions, corn has developed the fastest among the dryland food grains. The area in 1978 registered an increase of 99.597 million mu over 1952, constituting 97.7 percent of the total national increase of corn.

Table 4-5 Changes in the Structure of the Sowing Areas of Major Food Grain Crops at Different Regions

(1)地区 \ (2)比重 (3)项目	(5)1952年粮食作物播种面积组合比重%										(6)1978年粮食作物播种面积组合比重%									
	(7)粮食总计	(8)稻谷	(9)小麦	(10)旱粮合计	(11)玉米	(12)高粱	(13)谷子	(14)其它旱粮	(15)薯类	(16)大豆	(7)粮食总计	(8)稻谷	(9)小麦	(10)旱粮合计	(11)玉米	(12)高粱	(13)谷子	(14)其它旱粮	(15)薯类	(16)大豆
(4)全国合计	100	22.9	20.0	40.7	10.1	7.5	7.9	14.7	7.0	9.4	100	29.5	24.1	31.7	16.6	2.9	3.5	8.7	9.8	5.9
1.黑、新、宁	100	1.4	18.2	73.6	10.6	7.8	10.9	44.3	3.9	2.9	100	3.1	47.2	41.9	13.5	2.8	3.7	21.9	6.5	1.3
2.陕、甘、晋	100	1.5	33.1	54.9	10.4	3.7	14.7	26.1	5.1	5.4	100	1.6	37.0	48.9	19.5	4.1	8.2	17.2	9.4	3.1
3.辽、吉、冀	100	2.6	9.2	65.7	17.7	19.8	15.8	12.4	2.8	19.7	100	5.5	14.3	59.8	33.2	8.7	12.6	5.3	3.2	17.2
4.京、津、冀、鲁、豫	100	1.6	31.9	45.4	10.7	12.5	14.1	8.1	7.6	13.5	100	2.9	40.0	37.5	23.7	4.2	4.0	5.6	13.2	6.4
5.沪、苏、浙、皖、赣、鄂、湘	100	41.6	18.7	25.6	4.8	4.0	1.1	15.7	5.6	8.5	100	58.8	15.8	12.8	4.3	0.6	0.1	7.7	7.6	5.8
6.粤、桂、闽	100	75.1	2.3	6.3	4.6	0.4	0.6	0.7	13.7	2.6	100	72.2	6.8	9.0	5.6	0.1	0.2	3.1	9.6	2.4
7.川、云、贵	100	36.4	9.4	40.3	21.6	0.05	0.06	18.5	10.7	3.2	100	30.0	19.3	32.3	19.7	0.6	0.1	12.0	16.2	2.2
8.青、藏	100	—	33.2	18.1	—	—	-	57.6	8.7	—	100	0.1	42.8	51.2	—	—	—	51.2	5.9	—

(1)地区 \ (2)比重 (3)项目	(17)1978年比1952年播种面积比重增减%									
	(7)粮食总计	(8)稻谷	(9)小麦	(10)旱粮合计	(11)玉米	(12)高粱	(13)谷子	(14)其它旱粮	(15)薯类	(16)大豆
全国合计	+ 7.4	+21.3	+ 17.0	−24.2	+ 51.6	− 62.7	−56.6	−42.0	+35.8	−38.8
1.黑、新、宁	− 2.6	+10.5	+144.9	−46.1	+ 20.7	− 66.2	−68.0	+53.2	+55.8	−58.4
2.陕、甘、晋	+ 6.2	− 5.5	− 0.9	−20.8	+ 66.6	− 1.8	−50.4	−41.6	+61.4	−48.0
3.辽、吉、冀	+37.5	+132.1	+ 71.3	+ 0.5	+107.3	− 51.7	−12.4	−52.7	+29.9	− 4.8
4.京、津、冀、鲁、豫	− 4.9	+46.9	+ 3.2	−32.1	+ 81.4	− 71.9	−76.8	−42.8	+43.7	−61.5
5.沪、苏、浙、皖、赣、鄂、湘	+ 5.7	+36.6	− 17.9	−51.7	− 11.8	− 84.3	−92.6	−52.5	+31.3	−43.1
6.粤、桂、闽	+13.1	+ 5.9	+227.3	+55.6	+ 32.1	− 82.2	−67.7	+378.4	−22.8	+ 2.9
7.川、云、贵	+19.6	− 5.5	+138.9	− 7.1	+ 5.4	+1161.1	−33.9	−24.7	+74.7	−19.8
8.青、藏	+92.1	—	+148.1	+69.2	—	—		+70.5	+29.4	—

(18)* 台湾省统计资料缺缺

[key on following page]

Key to Table 4-5

(1) Region
(2) Percentage
(3) Item
(4) National total
    1. Mongolia, Xinjiang, Liaoning
    2. Shaanxi, Gansu, Shanxi
    3. Liaoning, Jilin, Heilongjiang
    4. Beijing, Tianjin, Hebei, Shandong, Henan
    5. Shanghai, Jiangsu, Zhejiang, Anhui, Hunan, Hubei, Jiangxi
    6. Guangdong, Guangxi, Fujian
    7. Sichuan, Yunnan, Guizhou
    8. Qinghai, Xizang
(5) Percentage of combination of sowing area of food grain crops in 1952
(6) Percentage of combination of sowing area of food grain crops in 1978
(7) Total of food grain crops
(8) Rice
(9) Wheat
(10) Dryland food grain total
(11) Corn
(12) Sorghum
(13) Millet
(14) Other dryland food grains
(15) Potato
(16) Soybean
(17) Percentage decrease in the sowing area from 1952 to 1978
(18) *Temporarily lacking statistical figures for Taiwan

4) The area of potato crops has increased in all places except in the south China region where the area slightly decreased because of expanded planting of winter wheat. The growth was the fastest in north China (summer sweet potato), constituting 34.9 percent of the total national increase in the area of potato crops.

5) The area of soybeans decreased overall except in south China. The largest decreases were in north China and the northwest. The production level and the level of food grains in these areas are generally low. In recent years, wheat, corn and paddy rice increased more, and mainly because of the low yield of soybean, careless management and neglect of production, the planting area greatly decreased. This is not entirely rational.

(3) Changes in the Method of Rotation of Food Grain Crops of Different Regions

Because the natural conditions and the socioeconomic conditions of each region of our nation are complex and varied, the differences in the structure of crops in each region are vast, thus forming many methods of rotational planting that adapt to the different conditions and characteristics of each region.

1. Rotational Planting Region Based on Rice in Paddy Fields of the South

The water and heat conditions of the broad region south of Qinling and the Hui River are superior. The yield of paddy rice is high and stable, the planting area of paddy rice has always constituted above 60 to 80 percent of the area of food grain crops, forming our nation's rotational planting region based on paddy rice. The major rotational planting methods from north to south are: double cropping of wheat and rice, double season rice, double season rice in winter multiple planting, and multiple cropping of double season rice.

Double cropping of wheat and rice: This system is mainly distributed in Yanjiang and Lixiahe in Jiangsu, Nanyang in Henan, Hanzhong in Shaanxi, north central Anhui, northern Hubei and Sichuan. The winter crop is mainly wheat, followed by barley and naked barley. Barley and naked barley mature early, beneficial to early transplanting of paddy rice and increasing yield. In recent years, because of the improvement in the conditions of water conservancy, many regions that originally only planted one season of rice and left the land in fallow in winter as winter paddy fields have changed to double cropping of rice and wheat. The more common method of rotational cropping is: paddy rice--wheat (or barley, naked barley, rape, broad bean, pea, green manure). In the northern rice regions, there are also many regions (such as the Xuhui region in Jiangsu, suburban Beijing and the Yinchuan Plains in Ningxia) that are expanding or test developing the double cropping system of wheat and rice.

The double season rice rotational planting system includes double season rice continuous planting and double season rice interplanting. In recent years, continuous planting of rice has developed rapidly in central and south China. The area of double season interplanted rice has greatly decreased. For example, in recent years in the 6 provinces of Guangdong and Guangxi, Hunan, Zhejiang, Jiangxi and Fujian the total area of double season continuous planting of rice

constitutes over 80 percent of the area of paddy fields. The double cropping system a year of winter fallow land and double season rice is still practiced in the southwest plateau. In most regions, one season of winter crop or green manure after double season rice forming a triple cropping a year system is still practiced. The traditional and main rotational planting system in our nation's double season rice regions is the rotational planting of double season rice and green manure (vetch, sickle alfalfa, astragalus, field radish), beneficial to retaining a definite soil fertility for continuous planting rice fields. Multiple planting of double season rice and rape benefits winter tilling of the rice fields and drying, plowing, ripening of the soil. This also increases the yield of oil bearing crops. Rotational planting of paddy rice and dryland crops of double season rice and the three wheats and sweet potato benefits improvement of the soil structure and elimination of weeds, but requires more fertilizers. Measures of application of fertilizers must be strengthened to realize stable and high yields. The more common method of multiple planting of double season rice and winter planting in the central China region is: double season rice--broad bean, pea, rape, three wheats, sweet potato. In the south China region, winter wheat or winter sweet potato is planted after harvesting double season late rice.

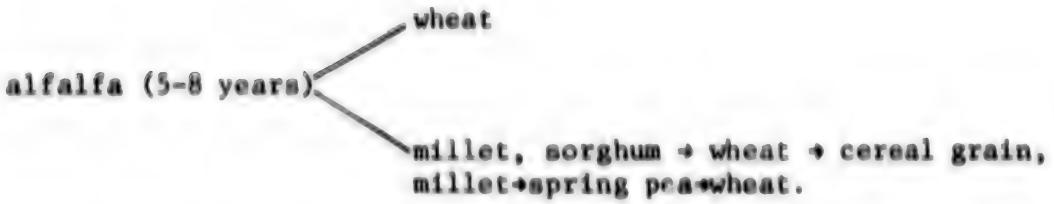
The multiple cropping system of triple season rice is mainly concentrated in parts of the south China region where heat is sufficient. The area of cultivation is relatively small, such as the eastern regions of Hainan Island. Recently, triple season rice has also been successfully test planted in Huaxian in suburban Guangzhou City and Wuhuaxian and the Meixian area. One season of winter wheat has even been added. There are also some regions that utilize double season interplanting of rice to plant another season of vegetables and one season of rape to become a multiple planting system of four harvests a year. But these three and four cropping systems must have an abundant labor force combined with superior conditions of water and fertilizers before high yields can be realized.

2. The Rotation Cropping Region Based on Winter Wheat in the North China Plains and Southeastern Part of the Loess Plateau

This region mainly includes the broad winter wheat planting area north of Qinling and the Hui River, east of Liupanshan, south of the Great Wall. Its main rotational planting methods (from north to south, west to east) are one cropping a year, triple cropping in 2 years and double cropping a year:

One cropping a year of winter wheat: This mainly includes the regions of the loess plateau of central Shanxi, northern Shanxi, northern Shaanxi, eastern Gansu, western Henan east of Liupanshan and west of Taihangshan. The area of wheat generally constitutes 30 to 40 percent of the sowing area of food grain crops. Arrangement of other crops centers around wheat. After continuous planting of wheat for several years, the fertility of the soil drops, and thus one season of late autumn crop is planted (millet, cereal grain, sorghum etc). The major methods of rotation are: 1) wheat (3-5 years)--summer sown millet (cereal grain or corn, or mixed planting of buckwheat and rape, or sorghum interplanted with black bean or sweet clover:

2)



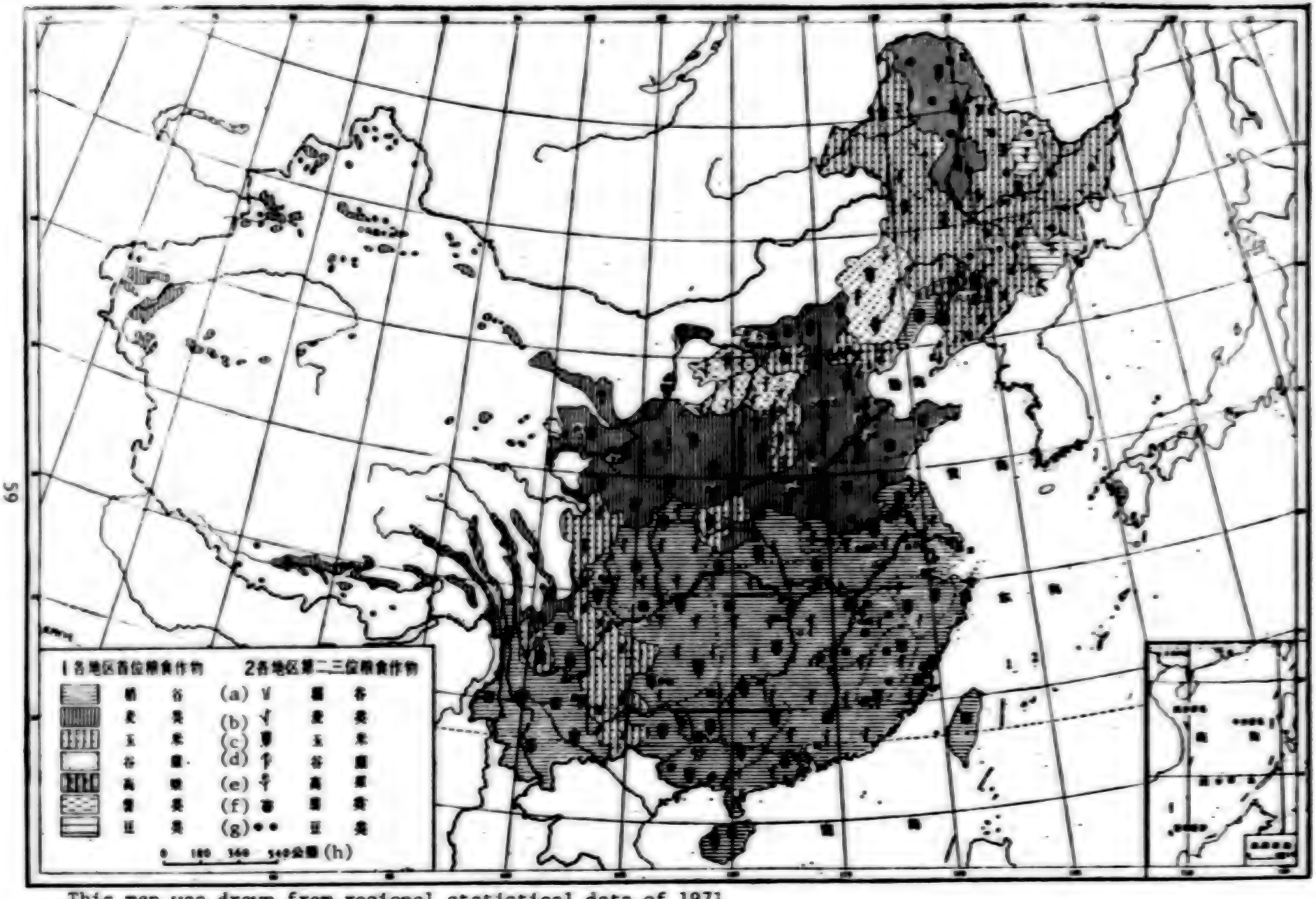
To assure stable yields and increase in yields of wheat, when fertilizers are deficient, the fertility of the soil is maintained and improved by mainly planting legume crops (pea, black bean and alfalfa, sweet clover) in summer fallow land. In addition, the fertility of the soil is revived by planting one short season of mung bean and sweet clover and such legume crops during the summer gap between harvesting and planting in the wheat fields of one cropping a year in Huibei, central Shaanxi, southern Shanxi, eastern Henan.

Rotational planting of triple cropping of winter wheat in 2 years: This area is wide, including the North China Plain east of Taihangshan, north of Hui River and Niufushan. It is our nation's largest concentrated winter wheat producing region. At the same time, it is also our nation's main concentrated region of dryland food grain crops and cotton. Winter wheat is rotated with corn, sweet potato, bean crops and cotton. Wheat is planted after harvesting of spring sown crops and summer sown crop is planted after harvesting of wheat, forming triple cropping in 2 years. The main methods of rotational planting are: 1) spring millet (or corn, sorghum, sweet potato)→winter wheat→summer corn interplanted with mung bean (or summer sweet potato, millet, soybean, mung bean); 2) cotton (2-3 years)→spring millet→wheat→summer sweet potato or soybean.

Rotational planting of double cropping of winter wheat a year: This is practiced in the irrigated land of the North China Plain and the soil of relatively high fertility. Winter wheat is rotated in reverse rotation with summer corn, summer soybean, summer sweet potato, summer millet of two croppings a year. The yield is higher and more stable. It is the main direction in implementing rational rotational planting to increase the multiple planting in the north China regions.

3. Rotational Planting Region of Soybean, Corn, Sorghum and Spring Wheat in the Northeast

The main crops of the three provinces of the northeast are soybean, sorghum, corn, millet. The 4 crops cover 73 percent of the total area of food grain crops. They are mainly one cropping a year. The main rotational planting method is spring wheat (or soybean)→soybean (or spring wheat)→sorghum (or millet). Basically, reverse cropping is practiced among soybean, spring wheat, sorghum (or corn) and millet. In general, soybean or millet is planted every 2 years or more, continuous cropping of wheat is done very seldom. Soybean is the best forecrop of wheat. Planting 1 year of soybean has important significance in retaining fertility of the land and increasing the economic income. Corn and millet are good crops for interplanting. They can eliminate weeds and benefit the production increases of wheat.



This map was drawn from regional statistical data of 1971.

Figure 4-2 Types of Combinations of Major Food Grain Crops of the Nation

Key:

1. Leading food grain crop of each region
2. Second and third food grain crop of each region

(a) Rice
(b) Wheat crops
(c) Corn
(d) Millet and cereal grains
(e) Sorghum
(f) Potato crops
(g) Beans
(h) Kilometers

4. Rotational Planting Region of Spring Wheat, Millet, Potato Crops Inside and Outside the Great Wall and the Northwestern Part of the Loess Plateau

This region mainly includes northern Shanxi, northern Hebei, Nei Monggol, southeastern Ningxia (Yandi, Tongxin), central Gansu. The climate here is dry, except for spring wheat, most of the crops are millet, cereal grains, barley, potatoes, peas, hyacinth bean that are tolerant to drought and have a relatively short growth period. Because of the short growth period and because there are less people and more land, basically it is one cropping a year, some of the regions practice resting (fallow) the land in rotation. The main methods of rotational planting are: 1) hyacinth bean (or pea)→spring wheat→peas (or potato, millet, cereal grain); 2) fallow land→spring wheat→cereal grain (or millet, potato, barley, peas)→fallow land.

These regions generally plant spring wheat in fallow land, peas or hyacinth bean fields to benefit increasing the yield of spring wheat. In recent years, many places have gradually reduced the area of resting and fallow land as farmland water conservancy construction developed and the areas of sweet clover and alfalfa and such legume green manure have increased.

5. Rotational Planting Region of Spring Wheat, Corn, Millet of the Northwestern Fertile Oases

This region includes Xinjiang, Hexi, northern Ningxia and the western irrigated region of Nei Monggol. Rainfall is scarce. Growth depends entirely upon irrigation. Food grain crops are mainly winter and spring wheat. Corn, millet and sorghum are also planted relatively commonly. Xinjiang and Hexi are also our nation's important cotton regions. The major rotational planting systems here are: 1) spring wheat (1-2 years)→millet (or cereal grain, potato)→peas (or mixed sowing of wheat and bean); 2) winter wheat→spring corn or spring sorghum.

Most of the regions west of Yumen generally plant dryland food grain crops in rotation after harvesting wheat and then plant bean crops. This favors eliminating weeds and revival of soil fertility. Peas, potatoes (because more fertilizers are applied) are all good forecrops of wheat.

6. Rotational Planting Region of Naked Barley, Spring Wheat, Pea

This region is mostly at high elevations, heat is generally deficient, the varieties of crops are simple, mainly naked barley, spring wheat and peas. The area of the three together constitutes over 80 percent of the sowing area of food grain crops. Generally 4-year or 5-year rotation of legume and graminaceous crops is practiced. The main method of rotation is: naked barley→mixed planting of naked barley and peas (or spring wheat)→peas→wheat (or rape)→fallow land.

4. Question Concerning the Regional Balance in Food Grain Production

After Liberation our nation has completely changed the historical dumping of "foreign rice" and the situation of transfering southern food grains to the north. But at present, food grain production is still not balanced.

According to analysis of the surveys of food grains at the beginning of the 1970's (1971-1973), the surplus and shortage of food grains in the nation's provinces (cities, autonomous regions) can be divided into the following six situations: 1) The five provinces of Heilongjiang, Jiangsu, Jilin, Hunan, Anhui had large surpluses; 2) The five provinces of Jiangxi, Hubei, Xichuan, Zhejiang, Henan had a relatively large surplus but fluctuation was great; 3) The four provinces (regions) of Guangdong, Guangxi, Yunnan, Shandong had slight surpluses; 4) The five provinces (regions) of Hebei, Fujian Guizhou, Xinjiang, Xizang basically were self-sufficient; 5) The six provinces (regions) of Nei Monggol, Gansu, Shanxi, Ningxia, Shaanxi, Qinghai had food grain shortages; 6) The provinces (cities) of Shanghai, Beijing, Tianjin, Liaoning had larger shortages of food grains.

Because of many reasons, the surpluses and shortages of food grains in the provinces (cities) during different periods frequently changed relatively greatly. For example, Sichuan and Zhejiang which had always had surplus food grains, had serious shortages once because of interference and sabotage by the extreme leftist line of the "gang of four." Again for example, Taiwan has always been famous for exporting rice, but beginning from the latter part of the 1960's, the province has to rely on large imports of wheat, corn and soybean supplements.

Because our nation's provinces and regions are large in area, within one province or region, often some areas have shortages and some areas have surpluses. According to statistics of 1974, 194 of the 2,134 county level administrative divisions provided 100 million commercial food grains. Jilin's Yushu County provided the most, 700 million jin; the 7 counties of Wuxian in Jiangsu provided over 400 million jin each. The commercial grains provided by these nearly 200 surplus food grain counties with a relatively high percentage of commodities constituted about half of the nation's grain purchases by the state. These counties are mainly distributed in the Taihu Plain, the basin of the two Lakes, Basin or Boyanghu and the Lixiahe region of northern Jiangsu in the middle and lower reaches of the Changjiang; the Nenjiang-Songhuajiang-Liaohe Plain of the northeast; the Pearl River Delta in south China; the Changjiang valley in central Sichuan (the western coastal region of Taiwan Province is also a surplus grain producing region). These regions are also mostly stable and traditional commercial food grain bases.

On the outskirts of this surplus food grain region with a high percentage of commodities are also many surplus food grain counties, estimated to be over 330 in number. They are mainly distributed in the eastern hilly regions and the western semi-agricultural and semi-livestock regions of the northeast, the Bashang region and Shijiazhuang irrigated region north of the Great Wall in Hebei, Jiaodong region in Shandong, Jiangsu and the Huibei region in Anhui, the

two banks of the Qiantangjiang and the coastal region in Zhejiang, northwest Fujian, Ganjiang and the middle and lower reaches of Fuhe in Jiangxi, the Chengdu Plain and the Xichang region in Sichuan, the Guanzhong Plain in Shaanxi, irrigated region in Ningxia, Houtao in Nei Monggol and the Hexi Corridor in Gansu. Most of these counties are national or provincial and regional new and old commercial food grain bases.

On the other hand, all cities (especially Shanghai, Beijing, Tianjin, Shenyang, Guangzhou, Wuhan), concentrated industrial and mining regions (such as the major mining and industrial bases of Anshan, Fushun, Benxi, Tangshan), forest regions (such as Daxinganling, Xiaoxinganling, Changbaishan, Nanling, eastern Taiwan), grazing regions (northern parts of Nei Monggol, Ningxia and Xizang, southern Qinghai and Gansu, mountain grazing regions of Xinjiang) are all major consumption regions of commercial grains.

Most of the counties and regions between the surplus food grain regions and the regions with a shortage of food grains are basically self-sufficient, but the degree of self-sufficiency is different. For example, the degree is higher in the high and cold regions of the northeast and the rice producing regions of the south, while the degree is lower in the northern dryland food grain crop regions.

At present, the degree of surplus and shortage of food grains in all regions is basically determined by the major flow of transfer of food grains throughout the nation: from the broad farm villages into the cities; from the farming regions into the industrial and mining regions, grazing regions and forest regions; from the continent to the islands (including Hainan Island). Concretely, the major directions of flow of large amounts and over long distances are: 1) from the northeast via land through Shanhaiguan, a part is transported to the northwest via the Longhai-Jingbao line; 2) from the various places of the middle and lower reaches of the Changjiang via waterways to Wuhan, Nanjing, Shanghai along the river and coastal cities in Jiangsu and Zhejiang provinces. In the cargo transported on the Changjiang, food grains have always been the leading cargo, generally constituting one-fourth of the total amount of cargo transported; 3) from the middle and lower reaches of the Changjiang to north China and the northwest via Jingguang and Jinpu lines over land. In the cargo transported on the Jingguang and Jinpu lines, food grains rank 4th; 4) from Sichuan to the northwest and Xizang via land.

The transfer and transportation of some food grains are not due to surplus or shortage but are for the needs of allocation of varieties. For example, the dryland food grains of the northeast (sorghum, corn, millet) are transported to the major and medium cities of north China and the south, the rice and rice grains of central China are transported to north China, the northwest and Liaoning, the rice grains and rice of Sichuan are transported to the northwest and Xizang, etc. Wheat is produced more commonly in all regions of the nation, therefore it is mostly supplied and sold in the vicinity and long distance transfer and transportation of wheat is not abundant.

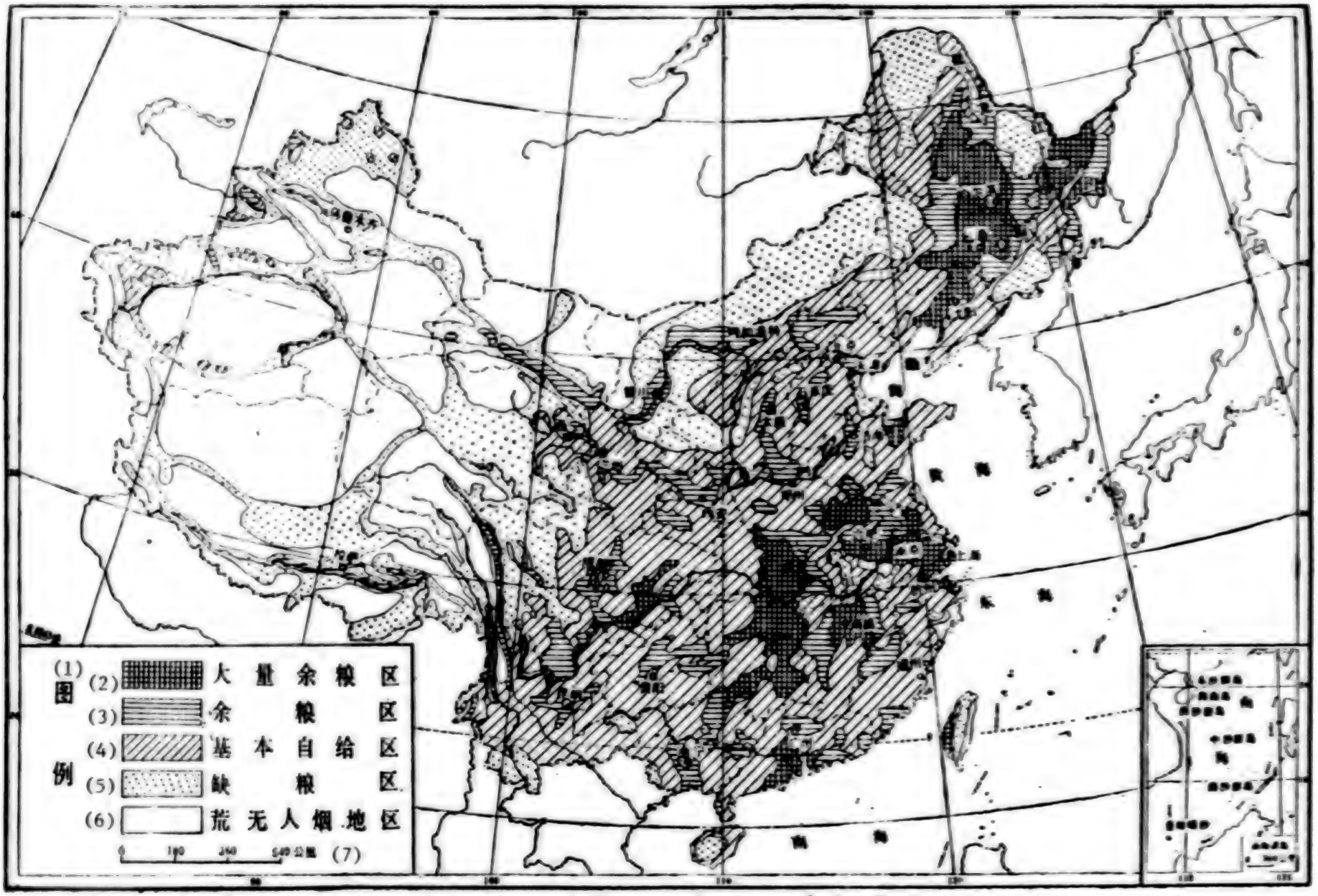


Figure 4-3 Distribution of Surplus and Shortage Regions of the Nation

Key:
(1) Legend
(2) Regions with a large surplus of food grains
(3) Regions with a surplus of food grains
(4) Basically self-sufficient regions
(5) Regions with a shortage of food grains
(6) Uninhabited regions
(7) Kilometers

Whether because of the differences in surplus and shortage of food grains of the various regions in the nation or because of the allocation of varieties, long distance transfer and transportation show our nation's distribution of food grain production and the structure of food grain crops are imbalanced. This problem remains to be rationally solved by suiting measures to circumstances in the future development of the construction of commercial food grain bases.

Section 3 Strengthen and Consolidate Construction of Commercial Food Grain Bases

1. Importance of Constructing Commercial Food Grain Bases and the Basic Types of Commercial Food Grain Bases in Our Nation

Establishment of commercial food grain bases centered around the task of production of food grains according to plan must fully take into consideration the rational utilization of various regional conditions to select the most suitable natural environments for food grain production. This not only can fully utilize the natural conditions and labor resources within the regions but can also facilitate concentration of a definite manpower, materials and financial strength for the necessary basic construction for the development of food grain production. This is an effective way to promote the production of food grains, increase the percentage of commercial products to satisfy socialist revolution and construction for the needs of food grains. This is also beneficial to increasing the labor production rate and the technical levels of specialization of food grain production, accumulating more systematic and richer productive experience and establishing a model for ordinary regions of food grain production to follow. This will serve greatly to promote the increase in the level of food grain production of the entire society. After commercial food grain bases are built well, state purchases of food grains, storage of food grains and the people's life will have a reliable assurance, and by rational distribution of commercial food grain bases, viewed from the overall situation, the irrational transportation of food grains over overly long distances can be greatly shortened, the pressure for transfer and transportation is lessened, the link between production and consumption can be made closer, and social labor can be conserved. This is very significant to strengthening war preparedness and firming up national defense.

The establishment of commercial food grain bases manifests the superiority of socialist agriculture. Its management policy is "to take food grain as the key link," to plant more high yielding food grain crops, and at the same time, to assure continued increases in yield of food grains and to fully satisfy the needs of the people's livelihood. Measures must be suited to local circumstances, "overall development" must be implemented according to need and possibility to correspondingly develop economic crops, livestock industry, forestry, fishery and sideline production. It differs from the extreme onesidedness and singleness and the management system that exploits the land of capitalist agriculture, and it also differs from the management method of small farm economy that is self-sufficient in production, planting a little of everything but the percentage of commodities is very low.

After Liberation, in the course of developing food grain production, the establishment of commercial food grain bases has exerted an important effect. Facts prove the commercial food grain bases possess a higher commodity percentage of products than the ordinary scattered food grain producing regions. For example, in 1971, the national average food grain commodity percentage was 17 percent, while the commodity percentage of most of the commercial food grain bases reached 20 to 30 percent. Again for example, in 1971, the nation had 222 counties that provided over 100 million jin of commercial grains, in 1974, 194 counties submitted to the state over 100 million jin of commercial grains. These major surplus food grain counties constituted the mainstream of the commercial food grain bases and the total amount of commercial grains provided by them constituted nearly half of the total amount of grains purchased by the state. Among these counties that have provided more commercial food grains, there are over half with an average per mu yield of food grains that had not reached the requirements of the "guideline." It can be seen that the potential for further increasing the unit yield and increasing the total yield of food grains is very great.

Regions to be established and managed as commercial food grain bases generally must possess the following conditions: 1) There is more surplus food grains, the commodity percentage of food grains is higher, the contribution to the state is larger; 2) The productive conditions are good, harvests are assured in drought and waterlogged conditions, the proportion of high and stable yielding farmland is larger, the foundation of agricultural production is good; 3) The potential for increased production is great even though at present the productive foundation is relatively poor and the commodity percentage of food grains is relatively low. The regions require less costly investment and the gain is quick, and production can progress as soon as they are established; 4) There is more wasteland suitable for farming, the source of water is sufficient, the potential for expanding the planting of grains is great; 5) Importing of productive materials and exporting of surplus grains are convenient. In fact, there are very few regions that simultaneously possess all of the above conditions. Most regions only possess one or two of the favorable conditions. In border and frontier regions, even though the conditions are relatively poor, conditions should be created to hasten the construction of commercial food grain bases to firm up national defense and develop the economy of the national minorities.

According to the management history of our nation's various commercial food grain bases, the unit yield, total yield, commodities percentage of food grains, and the potential for expanding planting and increasing production, the bases can be categorized into the following three types:

(1) The southern commercial food grain bases of the south with a relatively high productive level--These are mainly distributed in the deltas of the mouths of the major rivers of the south and the plains of lake basins of the middle reaches of the Changjiang. The population is dense, water and soil conditions are good, planting is fine, unit yields of food grains are high, and historically they have become regions that provided surplus food grains.

(2) The northern commercial food grain bases with a relatively low productive level--These are mainly distributed in the northeast and the irrigated regions of the middle reaches of the Yellow River in our nation. At present, the planting is less refined. The unit yields of food grains are not high, but there is more land and less people, therefore there are more surplus grains, and the potential for development is great. Of these, some have had a relatively early history of operation, some have been gradually built up after Liberation.

(3) New commercial food grain bases opened in recent years--These are mainly distributed in the plains of the Yellow, Hui and Hai rivers and the border regions after management. Originally they were mostly low yield regions with food grain shortages. After large scale control of water and basic farmland construction in recent years, production gradually increased and they have begun to provide commercial grains to the state.

Regarding the scope of supply and importance of the bases of food grain products, they can be divided into the following:

(1) National bases--These are regions such as the Songnen Plain, the plains of the three rivers and plains of central Jilin in the northeast, the southern Jiangsu region in the south, the plain of Hangjia Lake, the plain of Boyang Lake, the plains of the two lakes (Dongtinghu region and the Jianghan Plain), the diked and irrigated region of Dujiang, the Pearl River Delta and the northern Guangzhong Plain, the Houtao irrigated region in Nei Monggol, the Ningxia irrigated region, the Hexi Corridor, the Huibei Plain and the Heilonggang Plain. These 15 expanses of commercial food grain bases include 365 counties (cities, banners) and occupy a very important position in the nation's food grain production. Together, they have 20 percent of the farming population of the nation, 25 percent of the cultivated land of food grain crops, and their total yield of food grains constitutes 27 percent of the nation. The average multiple planting index of the cultivated land of food grains is about 139 percent. The average unit yield of the sowing area of food grains is 311 jin, higher than the national average by 7 percent. The average per capita amount of food grains per farmer is 975 jin, higher than the national average by 16 percent. The commodity percentage of food grains is 24.6 percent, higher than the national average by 7.6 percent; the total amount of food grains purchased by the state from all bases constitutes 38 percent of the national total. Their supply of surplus grains mostly surpasses the boundaries of the provinces (autonomous regions) in which they are located.

(2) Bases in provinces (autonomous regions)--These are regions such as the Panjing reclamation region in Liaoning and the south and north of Daqingshan in Nei Monggol, Shijiazhuang area in Hebei, Fen River valley in Shanxi, Yantai and Jiaodong regions in Shandong, northern plains of Henan, Lixiahe region in Jiangsu, Jinqu Basin in Zhejiang, central plain of Anhui, Jianyang and Longxi regions in Fujian, Xiangbei region in Hubei, southern region of Hunan, Nanning and Qinzhou regions in Guangxi, central flatlands in Yunnan, Changjiang valley in Sichuan, Huangshui valley in Qinghai and Tsaidam Basin, Ili River valley in Xinjiang and Beilu Plain in Tianshan, Yalu Tsangpo River valley in Xizang, etc.

In the future, further development of food grain production and rational arrangement of the distribution of food grain production must insist upon the policy of "taking food grains as the key link, overall development," arrange well the production of food grains in ordinary regions and especially the bases with a higher level of production must be firmly established and increased, the bases of a lower level of production must be developed, and construction of new bases should be hastened. The construction of national bases should be grasped with all efforts and the bases in provinces (autonomous regions) must also be emphasized, especially the development of bases in the border regions. At the same time, the situation in the low yielding regions with food grain shortages must be changed as quickly as possible.

[pp 140-164] [Text]

2. Assure and Improve the Southern Commercial Food Grain Bases With a Relatively High Production Level

The old commercial food grain bases that belong to this type of production level are: southern Jiangsu, the Plain of Hangjia Lake in Zhejiang, Boyanghu Plain in Jiangxi, the plains of the two lakes in the two provinces of Hubei and Hunan, the diked and irrigated region of Dujiang in Sichuan and the Pearl River Delta in Guangdong. All are nationally significant, and they have been historically our nation's major "grain storage" that provided surplus food grains (especially rice).

This type of bases all have a dense population, the soil is fertile, the water conservancy conditions are good, the level of fertilization is high, planting is refined, the yields are stable and high, the average multiple planting index is 193 percent. Although the area of triple cropping has gradually increased over the years, the double cropping a year system is still dominant. In recent years, the average per mu yield of cultivated land of food grain crops is about 830 jin, and except for the plains of Boyanghu and the two lakes, all have surpassed the "guideline" and the per mu yield is higher than the national average by about onefold. These 6 bases constitute the following percentages among the 15 national bases: 47.5 percent of the farming population, 26.1 percent of cultivated land planted with food grains, 36.1 percent of the sowing area of food grains, 49.7 percent of the yield of food grains, 47.1 percent of the grains purchased by the state. Because the local population is large, the local consumption of food grains is large, therefore the percentage of commodities is not high, generally about 20 to 25 percent. But nearly half of the counties that produce over 100 million jin of commercial grains a year throughout the nation are concentrated in these bases. Wuxian in southern Jiangsu had an average per mu yield of 1,350 jin in 1971, and the entire county submitted over 500 million jin of commercial grains. It can thus be seen that the potential is still great. These regions are commercial grain bases and are also concentrated producing regions of economic crops (cotton, sugar cane, bast fibers, sericulture). They are also often the major bases of commercial hogs, fowl and fresh water fish.

In these old bases, there is not much wasteland suitable for farming left, and in the future, expansion of production mainly depends upon improving the cropping

system, further increasing the rate of utilization of cultivated land, realizing water conservation of a high standard, completing high yielding and stable yielding farmland construction, opening up fertilizer sources, using and nurturing land, implementing scientific planting, increasing unit area yield. In recent years, the area of triple cropping has increased more rapidly, although there is less land and more people, the seasonal labor force is still not sufficient enough, and agricultural mechanization must be rapidly realized. The proportion of economic crops is large in this type of bases. The policy of "taking food grains as the key link, overall development, suiting measures to local circumstances, appropriate centralization" to correctly handle the relationship between food grain crops and diversification and the relationship between agriculture and commune and brigade industries to assure the overall development of socialist agriculture should be realized.

(1) Southern Jiangsu Region

The region of southern Jiangsu is our nation's important commercial food grain base. The entire region includes 8 counties of the Suzhou region, 10 counties of the Zhenjiang region and Jiangning County of Nanjing City, totaling 19 counties. The region is located in the transition zone between the northern subtropical zone and the middle subtropical zone. Most parts of the region are level land, the water network is dense, soil is fertile, water and heat resources are rich, natural conditions are superior. There are many cities in the region, industry has developed fast, traffic and transportation are developed, the forces to support agriculture are strong, and the farming labor force is sufficient. In 1973, the average per capita farming population had 1.35 mu of cultivated land, each labor force worked on about 2.7 mu of land. There is a fine tradition of fine planting. It is the region in Jiangsu Province that provides the greatest amount of commercial grains and the region with the highest level of food grain production. In 1975, the total yield of food grains registered an increase of 50 percent over that in 1963. In ordinary years, the total yield of food grains constitutes one-third of the total of the province, the amount of commercial grains provided each year constitutes 60 to 70 percent of the total of the province. In 1975, the entire region had 16 counties that produced a per mu yield of food grains surpassing the "guideline." Of these, 9 counties produced a per mu yield of over 1,000 jin. But development in the region is not balanced. The yield of high yielding and low yielding counties may differ by 500 to 600 jin. The yields of communes and brigades may differ by 1,000 jin. The yield of the Suzhou region is higher than the Zhenjiang region; the yield of the diked areas of plains is higher than the highland plains and hilly regions; the yield of paddy and dryland crop rotation is higher than the paddy rice continuous planting region. The differences in the commodity percentage of food grains are also large. For example, in the 4 counties of Wuxian, Kunshan, Wujiang and Wujin, per capita cultivated land is larger (1.6 to 2 mu), the per mu yield of cultivated land of food grain crops is over 1,000 jin. Each person provides 600 to 900 jin of commercial grains. In ordinary years, the region provides 300 to 400 million jin of commercial grains, and the commodities percentage is 40 to 50 percent, leading the province. In the counties of Wuxi and Yixing, average per capita cultivated land is (1.2 to 1.4 mu), each person provides an average of over 300 jin of commercial grains, the commodities percentage is about 30 percent.

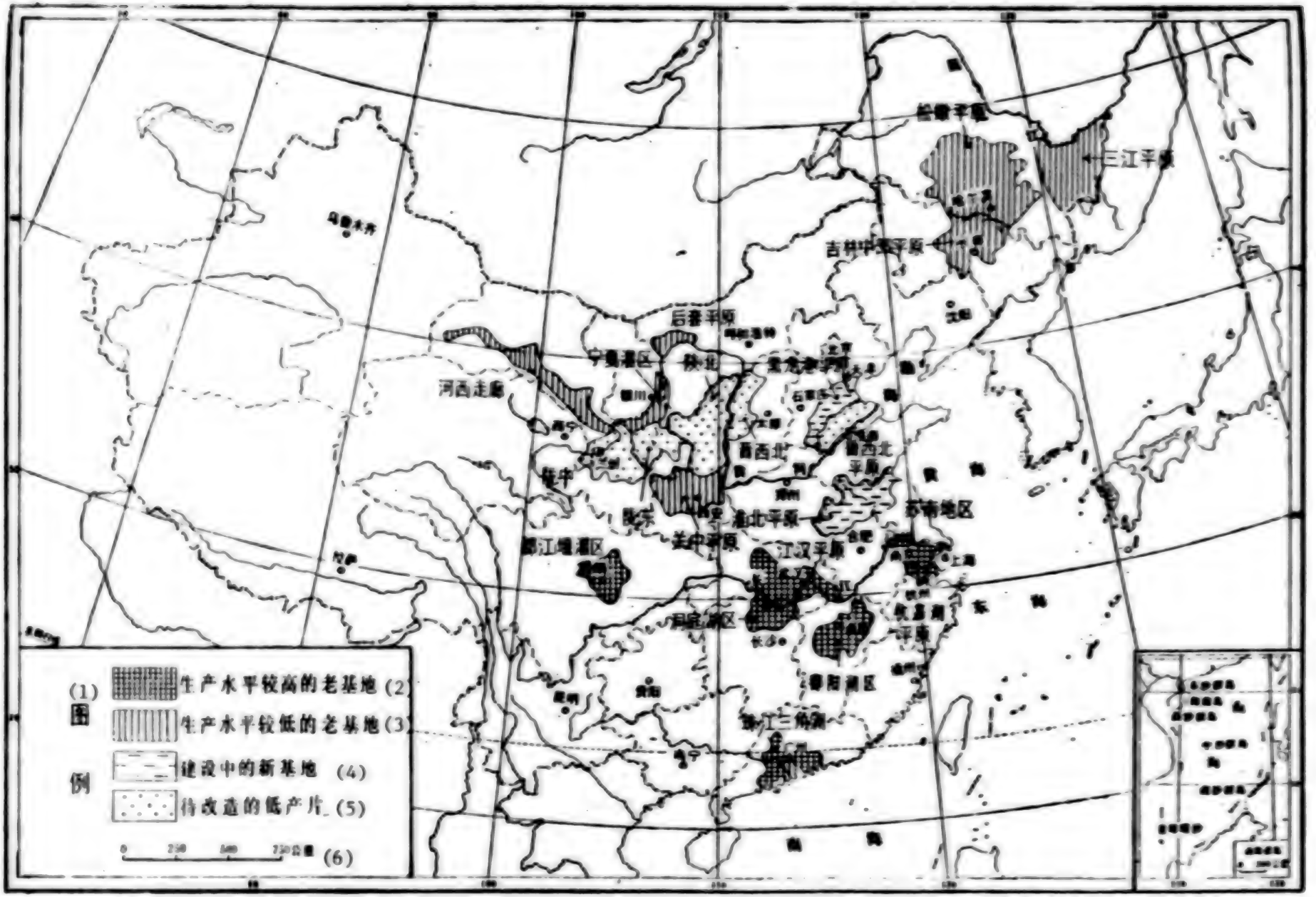


Figure 4-4 Distribution of the Nation's Major Commercial Food Grain Bases and Low Yielding Areas

Key: (1) Legend
(2) Old bases with a higher level of production
(3) Old bases with a lower level of production
(4) New bases being built
(5) Low yielding areas awaiting reform
(6) Kilometers

The production level of food grains of this region is high, and the amount of commercial products is large. These are mainly the results of long term reform of utilizing nature by the laboring people. After Liberation, they insisted on doing basic farmland construction in a big way. In water conservancy, they basically realized blocking off floods and built drainage and irrigation systems, there was rainfall, work was divided, labor forces were deployed, and most parts of the region had no worries of drought and waterlogging. For example, in the part of the Taihu valley region, 6.154 million mu of stable and high yielding farmland that was assured of producing harvests in drought and waterlogged conditions was built in 1976, constituting 64.8 percent of the area of cultivated land. At present, basic farmland construction is gradually progressing towards squaring of fields, a system of ditches for water conservancy, mechanized and electrified irrigation and drainage, and greening of the land.

1. Further Establishment of the Triple Cropping System of Double Season Rice More Firmly, Increasing the Unit Yield of Each Crop

Establishing the triple cropping system of double season rice more firmly and increasing the unit yields of each crop in a big way are the major efforts to improve the cropping system in the near future. Improving the planting system is a very effective way to promote large increases in food grain production. At the beginning of Liberation, this region test planted double season rice in a few counties in the south. Development was realized during the Great Leap Forward in 1958, but because of insufficient experience and some problems in work, there were ups and downs. It was only until 1970 after the northern agricultural conference that the productive conditions were greatly changed, and the development of large areas of the triple cropping system of double season rice was assured, thus the yields of food grains rapidly increased. For example, during the 10 years from 1964 to 1973, the area of double season rice in the Suzhou area increased 13 times, the total yield of double season rice increased 20 times, the total yield of food grain crops increased by 27.4 percent over 1964.

This region has less land and more people. There are no expanses of wasteland. In the future, continued progress should be towards broadness and depth of production. The present unit yield of cultivated land must be further increased and the present area of triple cropping of double season rice must be firmly established. At present, the area of double season rice of the entire region constitutes 52.7 percent of the area of rice grains. The Suzhou region in the east constitutes 65 percent (in the highest counties of Wujiang, Wuxian, Wuxi it can reach as high as 70 to 80 percent). The Zhenjiang area in the west constitutes only about 40 percent. The potential for appropriately expanding the triple cropping system of double season rice by suiting measures to circumstances still exists. But in the past years, the increase and decrease in the yield of double season rice have been large. The achievements of reforming the system already obtained should be firmly established and efforts should be towards increasing unit yield. In the recent 10 years, the entire region (1964-1973) registered a gradual annual increase in total yield of food grains of 3 percent. Of the 10 years, there were 6 years with gradual increases of from 1.6 to 36.1 percent. There were 4 years with decreases of from 3.4 to 10.7 percent. The

difference between an increase and a decrease in yield may be several hundred million jin to over a billion jin. The main reason for this phenomenon is: not all crops of rice and wheat produced increased yields, continued increased yields and balanced increased yields. For example, during the 9 years from 1964 to 1972, the analysis of the levels of unit yields of the five croppings of double season early rice, late rice, single season late rice, intermediate rice and the three wheats in the Suzhou area (see Table 4-6) shows that in the triple cropping system of double season rice, early rice produces a higher and more stable yield, the unit yields of double season late rice and the three wheats are low and not stable enough, greatly affecting the increases in food grain production of the entire year. This is a weak link in firmly establishing the triple cropping system of double season rice at present. Therefore, it is very necessary to grasp the increase of the unit yields of late rice and the three wheats and firmly establish the reformed planting system as the major projects in increasing the yield of food grains at present. But a series of conflicts must be solved, for example, changing double cropping to triple cropping requires a concentration of farm work, labor is short during the season of crop openings, mechanization cannot catch up, the consumption of water, fertilizers, seeds and farm chemicals will increase greatly, the cost of production will generally increase, and at some places, beans and winter green manure crops are suppressed, the conflict between using and nurturing of land becomes outstanding. All of these have not been rationally solved.

But to make sure that each crop will not delay the farming season is a necessary condition for seizing high and stable yields. For this, development of the triple cropping system of double season rice must seize the time, farm work must be kept in the season, the gap between seasons is tight, and there must not be any allowances. The double season late rice must safely head uniformly before 23 September in the southern areas of this region. It must head fully before 20 September in the northern areas to avoid disasters and realize high yields. To solve the conflict of the tightness of the seasons, the problem of mechanization of jobs with large workload and a strong seasonal nature such as removing seedlings, transplanting and harvesting must be solved with emphasis. At the same time, in the measures of cultivation in agriculture, the main problems are rational arrangement of the crop openings and the distribution of varieties, appropriate expansion of barley and naked barley to increase early triple croppings, and rational combination of early, intermediate and late varieties and active breeding of early maturing high yielding superior varieties. Rational combinations of different varieties must be based on the actual situations of the localities and the three favorable conditions must be given consideration, i.e., favorable to producing high yields in each season, bumper harvests for the entire year; favorable to implementing the policy of "taking food grains as the key link, overall development, suiting measures to local circumstances, appropriate concentration"; favorable to combining utilization and nurturing of land, the unified attention to high yield, stable yield, early maturity. Consideration must be given to the past and the future, appropriate arrangement to assure that "seizing the three factors" is not relaxed at the beginning, void at the middle and tight at the end. Generally speaking, late maturing varieties produce a higher yield than early maturing varieties. Late maturing varieties can be planted more at communes and brigades where the labor forces are abundant,

Table 4-6 Comparison of the Average Unit Yield of the Sowing Area of Each Crop of Rice and Wheat From 1964 to 1972 in the Suzhou Region (unit: jin/mu)

Item \ Year	1964	1965	1966	1967	1968	1969	1970	1971	1972
Total of rice grains	752.2	760.0	892.6	767.8	634.7	832.1	826.5	947.1	929.3
Including: early rice	502.0	644.1	632.3	599.0	550.2	623.0	583.3	576.0	607.4
intermediate rice	667.0	671.2	588.0	646.9	665.6	766.3	746.3	864.0	846.0
Single season late rice	768.0	752.2	877.8	751.6	602.0	774.3	677.8	743.5	756.6
Double season late rice	482.0	425.0	541.6	397.9	384.5	529.5	499.1	547.0	463.0
Total of three wheats	182.2	262.0	236.9	225.2	285.5	234.8	245.8	--	325.4
Including: wheat	186.0	254.6	243.9	--	281.4	240.0	249.7	334.3	338.8

the water and fertilizer conditions are good, and where the new methods of using plastic thin sheets to cultivate seedlings are used more. In addition, the experience and technique of utilizing heterosis of paddy rice in advanced regions should be actively learned and popularized, and hybrid superior varieties of single season rice and double season late rice suitable for the local region should be cultivated.

2. Open Up More Sources of Fertilizers, Increase the Level of Fertilization

Accumulating and making fertilizers in a big way is the basic condition for seizing high yields of the triple cropping system. It is also the key measure to improve the soil and reduce farming costs. This region has always emphasized accumulation, manufacture and application of fertilizers. Analysis (see Table 4-7) of the surveys of the yields and conditions of fertilizers of the 40 production brigades of Wuxian in 1973 proves that the relationship between the level of the yields and the level of application of fertilizers are very close. In the future, when popularizing the triple cropping of rice and wheat, the requirement for fertilizers is large, especially the seasonal nature of double season rice is strong and for early germination, sufficient fertilizers must be assured. To solve the problem of fertilizers of this region, farmhouse manure must be taken as the "main fertilizer" and chemical fertilizers should be used as "stimulating fertilizers." Combination of the mass movement and special teams must be insisted upon, spontaneous accumulation of fertilizers and accumulation of fertilizers during ordinary years must be combined, all ways must be found to open up broad sources of fertilizers by digging up river mud, cutting grass,

Table 4-7 The Relationship Between the Yields of Food Grains and the Level of Fertilization of the 40 Production Teams in Wuxian in 1973

Item	Classification of Yields: Below 1,000 jin	1,000-1,200	1,200-1,400	Over 1,400 jin	Total
Number of teams (unit)	6	17	7	10	40
Area of food grains (mu)	852.24	2,369.58	799.97	1,296.1	5,317.89
Average per mu yield (jin/mu)	958.4	1,125.5	1,310.3	1,625.1	1,247.8
Multiple planting area of rice of the previous season (percent)	82.82	83.40	86.23	88.79	85.06
Number of head of hogs raised per 100 mu	45.64	65.74	94.98	102.77	75.94
Grass mud rotted manure					
--Number of ash pools per 100 mu	41.89	50.07	58.86	56.09	51.54
--Number of dan per mu	79.4	113.4	116.8	121.4	110.4
The three aquatic plants					
--Grazing or culture (mu)	11.5	68	27	155.5	262
--Utilization of rice fields (mu)	10	125	52.3	14.3	201.6

grinding tree leaves, picking up garbage, mowing lawns, massively collecting grass mud rotted manure in a big way; raising the three domesticated animals (raising hogs, raising sheep, raising rabbits); raising the three aquatic plants in a big way (water poppy, water hyacinth, water lettuce) and green duckweed must be grasped tightly. The practice of "using the three water plants to promote raising of the three domesticated animals, to use the three animals to promote triple croppings," and the yield of fresh grass of the unit area of winter green manure (astragalus, sickle alfalfa) must be greatly increased, thus continuously expanding the source of fertilizers and increasing the level of fertilization. The method of achieving greater, faster, better and more economical results in accumulating and manufacturing fertilizers "to make fertilizers in four seasons" and "to store duckweed fertilizer" created by the masses in recent years can be popularized. At the same time the methods of application of fertilizers must be continuously improved by watching the sky and the land and by observing the situation of the seedlings, combining the lowering of the level of underground water and deep plowing and applying fertilizers to increase the aeration of the soil and the ability of the soil to provide fertilizers.

3. Further Increase the Standard of Drainage and Irrigation and Build High Standards of High and Stable Yielding Farmland

After changing double cropping to triple cropping, the varieties of crop openings are more complex, the demands upon water conservancy in farmland are more strict, and correspondingly, high standards of high and stable yielding farmland

must be built. The emphasis is on increasing the standards of drainage and irrigation, complete control of waterlogging and soaking damage, digging ditches in the fields deeply, lowering the water level beforehand, eliminating ground surface water, blocking out water not belonging in the fields, lowering the level of underground water to avoid waterlogging and soaking, reducing disease, benefiting soil aeration, decomposition of fertilizers, promoting development of the root system. In addition, reforming low yielding soil is an important aspect of promoting balanced increases in yields. The organic content of green purplish soil and black mountain soil in regions easily waterlogged is 2 to 3 percent, but drainage is poor, the soil is heavy, the soil is poorly cultivatable, nutrients do not easily decompose, the content of effective fertilizers is low, and improvement of drainage must be emphasized. Also for example, infertile terra brauca has an organic content of 1.2 percent. Its structure is poor, paddy rice does not easily tiller, fruiting is slight, application of organic fertilizers must be increased, rotational planting must be rational, green manure must be planted, and the application and use of phosphorous fertilizers must be combined to "use phosphorus to replace nitrogen."

(2) The Plain of Hangjiahu

Located between the valley of Qiantangjiang and Taihu, this region includes all the 10 counties in the Jianxing area in Zhejiang, suburbs of Hangzhou City and Yuhang County totaling 1 city and 11 counties. The ditches inside the region are plentiful, dikes and embankments connect with each other, river networks are densely distributed, irrigation is convenient, the soil is fertile, the history of reclamation and tilling is long, the population is dense, there is a lot of farm village labor force, each labor force works an average of 2.5 mu of cultivated land, the level of tilling is high, it is one of our nation's commercial grain bases that utilizes land most intensively and has the highest unit yield of food grains.

Heat and water conditions of this region are superior, the annual cumulative temperatures $\geq$ 10°C reaches 5,000°C. The frostless period is about 230 days, and the needs of continuous planting of rice can be satisfied. The annual average rainfall is 1,300 millimeters, the conditions to assure water are good. The triple cropping system has been gradually popularized on the original foundation of double cropping of rice and wheat since 1956 by fully utilizing these favorable conditions. Now, the multiple planting index has reached 232 percent. At present, the planting system in the paddy fields is mainly double season rice--"winter crop" (i.e., summer harvested barley, wheat, broad beans, peas, rape) and double season rice--green manure ("false triple cropping") as secondary. The area of double season rice has already reached 79 percent of the total area of paddy fields. This is the highest proportion in our nation's southern rice regions. In the northern region connected to Jiangsu, a small area of double cropping of rice and wheat is still retained. In the western Anjishan alluvial fields, there are a few single season paddy fields. Dryland that constitutes 9 percent of the area of cultivated land is mostly distributed in the natural embankment region along the Qiantangjiang. The soil is heavily sandy in texture. It is mostly planted with economic crops (cotton, bast fiber, peanuts, sesame) and dryland food grain crops (sweet potato, corn) and used for winter wheat continuous planting.

This region is the traditional commercial food grain base of Zhejiang, the productive level is very high. For example, in the bumper harvest year of 1972, the average per mu yield of early rice was 663 jin, the per mu yield of late rice was 504 jin, the average per mu yield of the cultivated land of food grains of the entire region was 1,190 jin, higher than the provincial average by 17 percent. The per mu yield of the triple cropping experimental fields in the region has already surpassed 2,900 jin, thus it can be seen that the potential for increased yields is very great. In the same year, each farm labor force produced an average of 2,310 jin of food grains, per capita farming population possessed 1,215 jin of food grains on the average, the commodity percentage of food grains reached 28.1 percent. All counties in the region are surplus food grain counties. Except for Anji County located in the mountain region and Haining County with a larger proportion of economic crops which produced less surplus food grains, each county provided over 100 million jin of commercial food grains. Jiaxing County which had the most surplus provided 380 million jin and the commodity percentage reached 41.2 percent.

Hangjiahu is not only a high yielding food grain base but diversification is also developed. It is a concentrated producing region of economic crops (oil bearing crops, cotton), commercial hogs, silkworm cocoons, fresh water fish, sheep, bamboo. Because diversification is developed, the income of the commune members is not only high (in 1973, each received a profit of 150 yuan) but food grain production provided large amounts of capital, fertilizers and feed, and sideline production has stimulated agriculture.

In the future, this region should be further promoted as an old commercial food grain base to realize continued high yields and higher yields, and the following problems should be solved well:

1. Further Establish the Achievement of Reforming the Planting System Firmly, Seize High Yields in Every Season

This region has more people and less land (an average of 1 mu of food grain land per person). How to stabilize and firmly establish the triple cropping system and increase the rate of land utilization are the major ways to increase the yields of food grains of this region. Analysis of the present level of unit yield indicates the situation of high yields in the middle (early rice) and low yields at the two ends (late rice, spring food grain crops) still exists. The average unit yield of late rice is equivalent to only 76 percent of early rice. The unit yield of spring grains is only 39 percent of early rice, both lower than the provincial average. The reason for a low yield of spring grains is the abundance of spring rain, "rain is abundant on 5 April," sunshine is weak, the level of underground water rises, unfavorable to the growth of winter wheat. The reason that the unit yield of late rice is not high is that the seasons are tight, often low temperatures occur during the middle 10 days of September, the daily average temperature drops to below 20°C, late rice cannot safely head uniformly. During the growth period of late rice, there is a lot of summer drought, autumn waterlogging, typhoons and diseases and insect pests. The amount of fertilization of late rice is not assured. In ordinary years, there are even 20 to 30 percent of "unfertilized fields."

The superior varieties of late rice are not yet definite. At present, although the unit yield of early rice is high, the sowing area is not as large as that of late rice mainly because the seedbeds of late rice occupy 10 to 17 percent of the paddy fields of the early season. This is a big waste. The method of transplanting small seedlings with soil or "two stage seedling cultivation" must be advocated to limit the seedbeds of late rice and expand the planting of early rice.

The wasteland suitable for farming in this region has mostly been developed. The potential for expanded cultivation is not big. But in the western hilly areas of the mountain regions there are still a lot of low yielding fields like cold waterlogged fields. Only one season of crops is planted a year. Drainage and irrigation facilities have to be improved, conditions must be actively created, multiple planting must be increased and the unit yield must be increased.

2. Correctly Handle the Relationship Between Utilization and Nurturing of Land

Whether double season rice can produce high yields in both seasons mainly is a problem of fertilizers. Fertilizers are the major conflict to further realize high and stable yields. This region has more people, many raise hogs and sheep, there are more organic fertilizers, the water surface is wide, there are more river mud and aquatic grasses, green manure is planted in winter, the level of fertilization is not low. But the method of fertilization is not rational enough, the supply of fertilizers in different seasons it not balanced, the treatment of the three seasons of crops is different, causing vast differences in yields. To firmly establish the triple cropping system and increase the unit yield, fertilizers must be grasped in a big way, the sources of fertilizers must be expanded in all directions by implementing planting, nurturing, accumulating and manufacturing together. The summer crop in the paddy fields in this region is basically double season rice, rotational planting can be implemented only for the winter crops. In recent years, to greatly increase the yield of food grains, the area of spring food grains in winter planting (wheat, bean) has expanded. The area of green manure has been compressed. This has affected the supply of feed (astragalus) and fertilizers. Therefore, the area of green manure such as astragalus must be assured, and the area must not be overly compressed because of the expansion of the planting of winter wheat. Secondly, rapeseed is also the major fertilizer for late rice and some economic crops. The proportion of planting of rape in the area of winter crops should be appropriately increased. The "three aquatic plants and one green manure" can be cultivated in paddy fields and inland river water surfaces. This can also increase some green manure.

3. Rationally arrange the relationship between food grain production and diversification. This region's sericulture is developed. The chemical fertilizers from the sale of silkworm cocoons are mostly used in food grain fields. This has promoted the production of food grains. In recent years, basic farmland construction has been carried out in a big way. Land is leveled and prepared. The originally scattered distribution of mulberry gardens in paddy fields was eliminated and mulberry trees have been moved to the sides of fields, increasing the rate of land utilization. But during the middle 10 days of May of each year, there is a shortage of labor, winter crops are harvested about

15 May, early rice is then planted, and between 22 to 23 May, spring silkworms "make their cocoons," these are the 3 days and nights when they consume the greatest amount of mulberry leaves, and at the same time, jute has grown to "3 cun long" and has to be transplanted and set, thus, the harvesting, planting, managing and feeding seasons are concentrated together, each fighting for labor force, and the conflict among the triple cropping system, "3 days and nights," "3 cun long" exists. Therefore each locality must consider the rationally proportional relationship among food grain crops, economic crops and sericulture according to the actual load of the soil and labor, and at the same time the crop varieties of each season must be rationally combined to separate the tight seasons. July and August are the season for harvesting early rice and transplanting late rice and are also the season for picking tea and cotton. The Hangzhou suburb with a larger area of tea plantations always asks outsiders to come and help transplant late rice. Therefore, the area of planting tea should be arranged rationally under the principle of not missing the farming time.

In addition, this region is a region with a lot of water surfaces, water conservancy conditions are good, but the topography is level and extensive, the slope of the ground surface is too level, during the past 20 years, after the eastern part of Taihu has been encircled and reclaimed, the reserved area for floods has reduced. Each year in June and July during the season of plum rains and the August and September typhoon season, the river water is raised and cannot flow smoothly, forming internal waterlogging, and a drainage system of deep trenches must be dug. In the lower reaches of the Qiantangjiang and close to the sea, the salt content of the river water increases because of tidal effects, agricultural irrigation and drinking water of the people are affected. Floodgates need to be built to separate salt water and fresh water.

(3) The Plains of the Two 'Hu's'

The Plains of the two 'Hu's' are the Jianghan Plain in Hubei and the Dongtinghu Plain of Hunan Province. They are situated in the middle reaches of the Changjiang, forming a wide lacustrine-alluvial plain. The area of land is over 90,000 square kilometers, including 48 counties (cities, towns)[1] and 18 state run farms. In 1971, the cultivated land totaled 46.19 million mu. Paddy rice fields constituted 61.6 percent, dryland constituted 38.4 percent. The population was 28.14 million, the farming population constituted 92.1 percent.

---

1. The 48 counties (cities, towns) are: all 12 counties and 1 city of the Jingzhou Prefecture, Huanggang County, Xishui County, Xinzhou County, Qichun County, Huangmei County, Guang(ji) County of Huanggang Prefecture; Jiayu County, Wuchang County, Echeng County of the Xianning Prefecture; Xiaogan County, Huangpo County, Hanchuan County, Yincheng County, Yumeng County, Hanyang County of the Xiaogan Prefecture; Yidu County, Zhijiang County of the Yichang Prefecture; Yicheng County of the Xiangyang Prefecture in Hubei Province. Yueyang, Lingxiang, Miluo, Huarong, and Xiangyin counties of the Yueyang Prefecture; Yiyang City, Yiyang, Nanxian, Yuanjiang counties and Jin City of Yiyang Prefecture; Changde City, Changde County, Hanshou County, Taoyuan County, Linli County, Li County and Anxiang County of Changde Prefecture.

Except for a small part of hilly land and mounds the majority of the land of the two 'Hu's' is level. The soil layer is deep and thick, the soil is fertile, the amount of heat is rich, rainfall is abundant, the conditions for agricultural production are superior. But the northern part of this region is closely connected to the narrow passage of Nanxiang, the northern cold front in spring and autumn can enter directly through the narrow passage. Overcast, rain and low temperatures frequently emerge, extreme low temperatures can reach -15°C, exerting an unfavorable effect upon the growth of tea and fruit trees, the safe and uniform heading of double season late rice, maturation of summer grains and cultivation of seedlings of each rice.

This region is one of our nation's old commercial food grain bases. The rivers are abundant inside the region; there are many lakes. After a long period of work and construction by the laboring people, it has become our nation's "cotton and grain storage" and "place of plenty of fish and rice." In 1971, the yields of food grains, cotton and oil constituted 40, 80.1 and 39.6 percent respectively of the total yields of the two provinces of Hubei and Hunan. This region has a good foundation of agricultural production and the level is high. For example, the per mu yield of food grains is 12.6 percent higher than the average levels of the two provinces. In 1975, the region had 30 counties (cities, towns) that produced a per mu yield of food grains that reached the "guideline." The per capita farming population of the entire region possessed an average of 911 jin of food grains, the commodity percentage of food grains was generally about 22 percent.

The main food grain crop is rice grains. In 1971, the yield constituted 86.5 percent of the total yield of food grains, followed by wheat which constituted 6.1 percent. In recent years, the proportion of wheat has been gradually increasing. The triple cropping system mainly of double season rice and green manure rotated in paddy fields constituted 60 percent of the area of paddy fields. The area of single cropping paddy fields has been decreasing year after year. The main method of rotation in the dryland of this region of double cropping a year is wheat (bean)--cotton. The region's broad hilly areas and mounds that surround the lakes are short of water sources and they are not fully utilized. The potential for increasing the yield of food grains is great.

To better develop the function of the food grain production bases of this region, the following three problems must be solved.

1. Grasp Water Conservancy Construction Well, Increase the Ability of Drainage and Irrigation

The plains of the two 'Hu's' are the downthrown basins of the middle reaches of the Changjiang. The topography is low, the elevation in general is not higher than 50 meters above sea level. Each year in May and June during the period of flooding due to plum rains, the waters from the southern and northern rivers gather in the lakes, the water level of the lakes rises quickly. From July to September, water from the upper and middle reaches of the Changjiang pours into Dongtinghu, causing the threat of flooding. In particular, when flooding due to plum rains is late or when the water from the middle and upper reaches of the

Changjiang comes early, the two flows meet, the threat of flooding and waterlogging becomes more serious. Since Liberation, although water conservancy construction in this region has greatly developed, at present the standard of flood prevention and drainage of waterlogged conditions is still not high (for example, river embankments in the Dongtinghu Plain that meet the standard of preventing floods - 20 years constitute only 28.4 percent, dangerous embankments constitu -3.9 percent). Damage by floods and waterlogging is still relatively serious. Damage by drought also exerts a definite effect. Therefore, the stability of agricultural production at present is still relatively poor. During the 24 years from 1949 to 1972, one-third of the years suffered from relatively serious reduction in yield. It can be seen that further improving the ability to prevent floods and resist drought and draining waterlogged conditions and greatly overcoming natural disasters with all efforts are important links in stabilizing the production of food grains.

In the regions of the plains next to lakes, waterlogging is the major threat to agricultural production. For example, in 1973, damage from waterlogging in the 3 counties of Qi(chun), Guang(ji), Huang(mei) reduced the yield of food grains by 147 million jin. This type of region should be managed mainly by draining and some large, medium and small power drainage stations should be built. At the same time, efforts should be combined with dredging rivers, lakes, ports and branches of rivers, control of lakes to adjust water reserves, prohibition of encircling land in lakes to build fields. At places where the topography is overly low, deep trenches must be dug to raise the fields and the surface of the fields and lower the level of underground water. Practice proves that "willing to dig a line will produce a whole expanse of increased yields." The standard of the drainage of waterlogging in regions next to lakes should first be to prevent flooding for 10 years and then to elevate the standard to prevent flooding for 20 years. The conditions of agricultural production must be changed completely. In addition, construction of gardens and fields must be actively developed to level and prepare the land so that the fields are all uniform in direction, and sizes of the fields are equal, the fields, water, forests, roads and power are systematized to realize garden farming on cultivated land with river networks.

The topography of hilly areas and mounds have insufficient water sources, and drought is the major conflict in food grain production. For example, from 1953 to 1972, drought caused serious reduction in the yields of food grains in Yiyang County in 7 years. Therefore, in this type of region, farmland construction centered around leveling and preparing the land should be grasped tightly. Slopeland should be changed to terrace land in a big way, plains should be created in hilly areas and mounds. As cultivated land is being changed into garden fields, water sources must be widely opened up to develop irrigation and to greatly increase the ability to resist drought in construction of water conservancy. Measures must be suited to local circumstances to build ponds and reservoirs and water conservancy projects in a big way so that water can be stored when it can be stored, water can be brought when it can be brought and water can be drawn when it can be drawn to truly solve the problem of water sources for irrigation.

At the same time, the presently available water conservancy projects must be rapidly completed (such as river embankments which must be elevated and fortified according to standards, platforms must be built for embankments at dangerous sections, ponds must be filled to fortify the base) and supporting systems of ditches must be rapidly completed to fully develop their function in preventing floods, in drainage and irrigation.

2. Actively Create Conditions, Suit Measures to Local Circumstances To Appropriately Expand the Area of Multiple Plantings

At present, the area of triple cropping a year in the cultivated land of this region is small, constituting only 10 percent of the area of paddy fields. There are some fields which are too low, water accumulates in the fields in ordinary years, or the fields have a high topography, water sources are lacking, or there is a shortage of labor and fertilizers are deficient, etc., thus only one cropping a year is possible. This region is located in the central subtropical zone, water and heat resources are rich, the soil is fertile, the natural conditions are superior. Therefore, conditions must be actively created, measures must be suited to expand the area of multiple planting, and the potential for increased yield of food grains must be exploited fully.

Because the area of green manure and double season rice in this region at present is large, this has affected the expansion of the area of winter wheat. Also because winter planted green manure and double season rice are in continuous cropping for long periods, the properties of the soil have worsened (the property of the soil becomes cold, the soil becomes hardpan, the physical and chemical properties are poor, water, fertilizers, aeration, and heat are not coordinated, although the content of organic matter in the soil is high, the release is slow, the amount of effective nutrients is small), there are a lot of weeds, diseases and insect pests increase, early germination of early rice and increases in yield are affected, and the yield and quality of fresh grass of green manure drop. All of these require considering appropriately compressing the area of winter planted green manure based on actual need and possible conditions. The areas of winter planted food grain crops and oil bearing crops should be gradually expanded. Winter planting with small reverse cropping and rotation of paddy and dryland crops must be implemented. In addition, efforts should be made to create conditions to reform single cropping paddy fields, change one cropping a year to double cropping of paddy and dryland crops a year or triple cropping a year. Dryland crops should be the main crops in the hilly areas and mounds where the source of water is lacking or where conditions for irrigation are lacking. As water conservancy conditions are gradually improved, measures must be suited to local circumstances to implement the transformation of dryland into paddy fields or implement planting of two paddy crops and one dryland crop or two dryland crops and one paddy crop.

3. Open Up Sources of Fertilizers, Further Increase the Level of Fertilization

The region's construction for fertilizers already has a good foundation. For example, hog raising has a high level of accumulation of manure. The area of winter green manure is large. But in the future, as the level of production of food grains increases, the area of multiple planting expands, winter green

manure is suppressed, the problem of fertilizers will become outstanding. To fully develop the potential for increasing yield of reforming the planting system, construction for fertilizers must be hastened besides the selection of superior varieties, rational arrangement of crop openings, strengthening field management and such measures. The major measures are: 1) further develop hog raising for accumulation of manure, widely gather farmhouse manure and lake mud, river mud, pond mud; 2) grasp tightly the management of winter planted green manure, work to increase unit yield, dig ditches and dry the fields, drain the water in a timely manner, increase the application of phosphorous fertilizers, dibble with manure attached to greatly increase the yield of fresh grass; 3) fully utilize the many superior conditions of water surfaces, develop "the three aquatic plants and one duckweed," especially raising of duckweed in the paddy fields, and nurture the soil. These will make the land fertile and will also conserve labor for transportation. Development of "the three aquatic plants" can be combined with the development of hog raising to realize prosperity in both food grains and livestock; 4) companion planting in the fields must be done in a big way to develop short term green manure.

(4) Boyanghu Plain

The Boyanghu Plain and the plain of the lower reaches of the Fuhe and Ganjiang in Jiangxu is one of our nation's oldest commercial food grain bases. Administratively it includes the 2 counties of Nanchang City, 3 counties in the Yichuan region, 4 counties in the Shangrao region, 3 counties in the Fuzhou region, totaling 12 counties. In 1972, the total yield of food grains constituted one-third of the total of the entire province of Jiangxi. Each farming laborer produced an average of 2,968 jin, there were 9 counties in the region that produced over 400 million jin of food grains, the commodity percentage of food grains reached 21.3 percent. Except food grains, cotton, oil bearing crops and hogs are also produced in abundance, separately constituting about one-third of the total of the province.

This region is a rather typical farming region of the double cropping a year system of the south. The sowing area of paddy rice generally constitutes over 80 percent of the total sowing area of food grain crops. The yield constitutes above 90 percent. Continuous planting of double season rice and winter green manure is more common. Intermediate rice and single season early rice constitute only one-fifth of the paddy fields. The sowing area of spring grains is small, and winter green manure occupies over 80 percent of the winter planted area.

Food grain production of this region is not stable enough. The unit yield of food grain crops is the lowest among our nation's southern old commercial food grain bases. For example, in 1971, the per mu yield of cultivated land of food grain crops was only 678 jin, the per mu yield of wheat was only 100 jin. In 1975, there were only three counties that reached the "guideline." The reasons are mainly that water conservancy construction in the farmland is poor, the ability to resist disaster is poor, thus the differences in bumper harvests and poor harvests of food grains are large. For example, in 1954, the region was damaged by floods, the total yield of food grains dropped 18 percent from that

of 1953. In 1962, flood damage occurred again, and the yield of food grains dropped again by 5 percent from 1961. In 1973, flood occurred again, 41 percent of the cultivated land was submerged (constituting 52 percent of the area submerged by flood water throughout the province). Early rice alone dropped in yield by 1.1 billion jin. At present, the region's high and stable yielding fields constitute only one-fifth of the cultivated land.

But the potential for increasing yield of food grains is great. 1) The ratio of people and land is low. Each farmer works 1.75 mu of land, more than that in the other major commercial grain bases in the south. 2) At present, the unit yield of food grains is low, the area of low yielding fields still constitutes one-third. 3) The multiple planting index of cultivated land of food grains is low, at present, it is only 195.5 percent.

For this, emphasis should be placed on the following three aspects.

1. Grasp Tightly Basic Farmland Construction Centered Around Control of Water, Expand Stable and High Yielding Fields

The period of high waters of the rivers in this region generally lasts for half a year (April to October). The cultivated land is threatened by external floods and internal waterlogging. Over 40 percent of the cultivated land relies on dikes and embankments for protection (constituting 64 percent of the area protected by dikes and embankments in the province). For example, in the 1973 flood, over 240 dikes in the province burst, mainly in this region. The present dikes and embankments are thin, low, there are many hidden weaknesses; the dikes and embankments with a height over the water level of the big flood in 1954 constitute only 3 percent of the total number of dikes and embankments. The area of protected cultivated land is less than 1 million mu. All dikes and embankments should be elevated and strengthened, the main sections of the embankments should be covered with stones to protect the slope so that they can resist even large floods. At present, the area of assured harvests in drought and waterlogged conditions constitutes only 46 percent of the cultivated land. In general, the ability to drain waterlogged conditions is poor, soaking damage is serious. Inland lakes should be used to regulate the reserve, culverts and floodgates should be built appropriately, large power drainage and irrigation stations should be built. Arrangements should be uniform for overall planning and efforts should be united to control water. A group of large drainage projects should be built. Via many different measures, efforts should be made to enable the draining away of massive internal waterlogging on the scale of the 1973 flood within 3 days. To assure that Boyanghu serves as a reserve for flood water, the encircled and reclaimed regions (such as Kangshan) in the lake area should be coordinated with the other regions to fully develop and utilize them but in the future the encircling and reclaiming of lake areas should not expand. In the future, the productive conditions should be changed completely to build stable and high yielding farmland first by coordinating efforts with basic farmland construction, grasp well the continued construction and completion of already existing water conservancy projects, exploit the potential of the projects, expand the area of irrigation, eliminate overall irrigation and irrigation by channeling water through furrows, suit measures to local circumstances, level and prepare the land, and plow deeply to improve the soil.

2. Grasp Tightly the Weak Links in Food Grain Production, Work Towards Unit Yield

Analysis of the productive levels of the various food grain crops of this region shows those of double season late rice and wheat are the lowest. The unit yield of double season late rice is lower than that of early rice by an average of 60 percent, and that of wheat is even lower. The area of double season late rice is large, and its effect upon increasing the total yield of food grains is greater. Therefore, in the future, to increase the total yield of food grains in this region, the production of double season late rice and spring food grains must be grasped tightly as the unit yield of early rice continuously increases so that the unit yield of the total can be increased. For this, the unilateral concept of "emphasizing early (rice) and slighting late (rice)" must be overcome. At the same time, active measures must be taken: the problem of deficient supply of fertilizers must be solved, hogs must be raised in a big way to accumulate manure, "the three aquatic plants and one duckweed" must be developed, the unit yield of winter sown green manure should be increased, the unfavorable effects of autumn drought, typhoons, diseases and insect pests, low temperatures should be overcome with efforts, in particular, the yield of wheat must be increased, emphasis should be placed on grasping well farmland water conservancy, drainage ditches must be dug well for timely drainage of waterlogged conditions, and the damage caused by soaking of crops because of the rise in the underground water level due to continuous overcast and rain during the period before maturation of wheat should be completely eliminated. On the basis of increasing the unit yield of winter green manure, measures should be suited to local circumstances to compress the area of winter green manure appropriately and to expand the planting of wheat to increase the total yield of wheat.

The area of low yielding fields of the entire region still covers over 3 million mu, constituting about one-third of the cultivated land. The per mu yield is only 400 to 500 jin, some places even produce only 200 to 300 jin. This seriously affects the increase in the total yield of food grains. Reform of low yielding fields must be grasped tightly, improvement of the soil must be done in a big way, soil fertility must be banked, low yields must be changed to high yields to greatly increase the total yield of food grains.

3. Hasten the Progress of Agricultural Mechanization, Solve the Problem of Labor Shortage

In this region, the per capita occupation of cultivated land is larger, and this region is also a concentrated cotton producing region. Each year, the time of resisting floods and draining waterlogged conditions is long, the intensity is large, and much labor force is used. In particular this region is the key region infected by schistosomiasis. The area of damage including Boyang, Yugan, Nanchang, Xinjian, Fengcheng, Gaoan, Jinxian counties covers 730,000 mu (constituting 79 percent of the area of damage throughout the province). The population being threatened by schistosomiasis in the diseased infected region numbers 200,000. The labor force is deeply affected. Therefore, the conflicts among basic farmland construction, field management, refined planting and

scientific planting are great. Especially, the level of machine plowing is lower than the average level of the province, the conflict of competition of labor between food grains and cotton, resisting floods and draining waterlogged conditions and field management is very outstanding. Therefore, while doing the work in preventing schistosomiasis well in the future, the elevation of the level of agricultural mechanization must be rapidly carried out to solve the problem of a shortage of labor completely.

The land in this region is flat. It is suitable for machine plowing. This is a very favorable condition. The large scale increase in food grain production in this region is entirely possible as long as basic farmland construction can be further hastened, the number of tractors is increased, the problem of such machinery for transplanting, harvesting, threshing, intertilling, transportation, crushing feed can be solved, field management can be strengthened, and scientific planting can be carried out in a big way.

(5) Dujiangyan Irrigated Region

The scope of the commercial grain base in western Sichuan used to refer to the plain of the middle reaches of the Minjiang centered around Chengdu. But for over 20 years, as the irrigated region of Dujiangyan gradually increased, the scope now also includes the new and old irrigated regions of Tuojiang and Fujiang. Administratively this region includes: suburbs of Chengdu City, all 14 counties in the Wenjiang region, the 4 counties of the northeastern part of the Leshan region, the 5 counties in the southern part of the Mianyang region, Jianyang County in the Neijiang region, totaling 1 city and 24 counties. This base is easily operated and managed and is convenient for planned construction on the foundation of the same large scale water conservancy projects.

This region is located in the alluvial fan of Minjiang, Tuojiang and Fujiang. The topography is level, mostly plains, the low mountain area of Longquanshan is at the center and shallow hills are in the west and the north. The water conservancy resources are rich, the annual average rainfall is about 1,000 millimeters. The annual rainfall on the slopeland near the Qionglai mountain region in the west can reach 1,500 millimeters. The average flow in the Minjiang is 480 cubic meters per second, the total annual runoff reaches 15 billion cubic meters. During the period of Emperior Zhaoxiang of the Qin Dynasty 256 B.C., Magistrate Li Bing of the prefecture led the people of western Sichuan to build the Dujiang dike in Guanxian to irrigate the broad region of the plain. But under the long period of reactionary rule of old China, the Dujiang dike was not repaired, and in 1949 at the time of Liberation, there was only 1.9 million mu of irrigated fields. After Liberation, this project underwent complete repair and the following projects were added: Renminqu, Xihe (Sanheyan), Dongfengqu, Jiefangqu (Tongjiyan), Bailiqu, Longquanshan, Heilongtan irrigated regions, and 2 tunnels were built through Longquanshan to lead the water of Minjiang eastward to benefit the areas expanding to the upper reaches of Tuojiang and Fujiang, irrigating a total of 8 million mu. Self-irrigation was basically realized by utilizing the natural slopes from the northwest to the southeast. There are 1.3 million mu that are irrigated by water drawn from sources other than the Dujiangyan water source. Some of the slopeland are irrigated by carrying water.

In 1973, the whole region had a total of 17.97 million mu of cultivated land, the effectively irrigated area was 9.14 million mu, the area of high and stable yielding farmland assured of harvests in drought and waterlogged conditions was 7.61 million mu. Although water conservancy facilities already have a good foundation, the canal system and facilities can irrigate but cannot drain, and with the continued expansion of the irrigated region, the canals lengthen, the flow increases, there is a lot of leakage, water emerges from the ancient river channels, thus, the underground water level rises (less than 1 meter below the ground surface of the plain), affecting the sowing and yield of crops sown in late autumn (winter crops). In the flat land regions, there are many waterlogged fields, fields with water transportation, fields that lose sand and water and such low yielding fields (in Wenjiang region alone there are 1.27 million mu, constituting 24 percent of the surface area of the fields), unit yield is less than the ordinary fields by 40 to 100 percent. All of these need to be rebuilt. In addition, the hilly regions lack water sources, and there are 1.52 million mu of winter paddy fields of one planting season a year, constituting 14.6 percent of the paddy fields of the entire region.

The area of cultivated land of food grains in 1973 constituted 70 percent of the total area of cultivated land (12.8 million mu), the average multiple planting index is 189 percent. The frostless period of this region is 280-295 days, the cumulative temperature $\geq$ 10°C is above 5000°C. The heat conditions are far better than the Changjiang Delta. It can thus be seen that the potential for increasing the multiple planting is very great. At present, the traditional double cropping system of rice and wheat is dominant, the area of triple cropping of double season rice constitutes 11 percent of the cultivated land, lower than the average of the entire province (14.6 percent). The reason is that the yield of double season rice is affected by climatic conditions. The speed of increase in yield is not as fast as winter wheat, corn, sweet potato, thus causing the yields of the paddy fields of multiple plantings to become lower than that of dryland. In fact, comparison of the Sichuan Basin and the middle reaches of the Changjiang at the same latitude shows that the annual average temperature is higher by 1°C to 2°C, the temperature in the coldest month is higher by 2°C to 3°C. Spring arrives at the end of February and the beginning of March, summer lasts for 5 months. This characteristic of a warm winter, early spring, long summer is extremely beneficial to the growth of food grain crops. But the shortcoming is that the spring temperatures are not stable enough, after sowing of early rice, cold fronts and low temperatures often occur at the end of March, causing the seedlings to rot. Autumn temperatures often drop too quickly, autumn rain persists, unfavorable to heading and flowering of late rice, and the crop even does not fruit, the yield of late rice is not high and is unstable (the unit yield of one season of intermediate rice in this region is 550 to 650 jin while the unit yield of early rice is 450 to 550 jin, the yield of late rice is only 250 to 350 jin), therefore, how to select early and late rice varieties suitable to this region's climatic characteristics is the key measure to expand the yield of grains and multiple planting.

This region has a long history of reclamation and planting. The population is dense. In 1973, the per capita farming population had an average of 1.3 mu, each farmer had to work 2.9 mu. Planting is refined, the amount of application

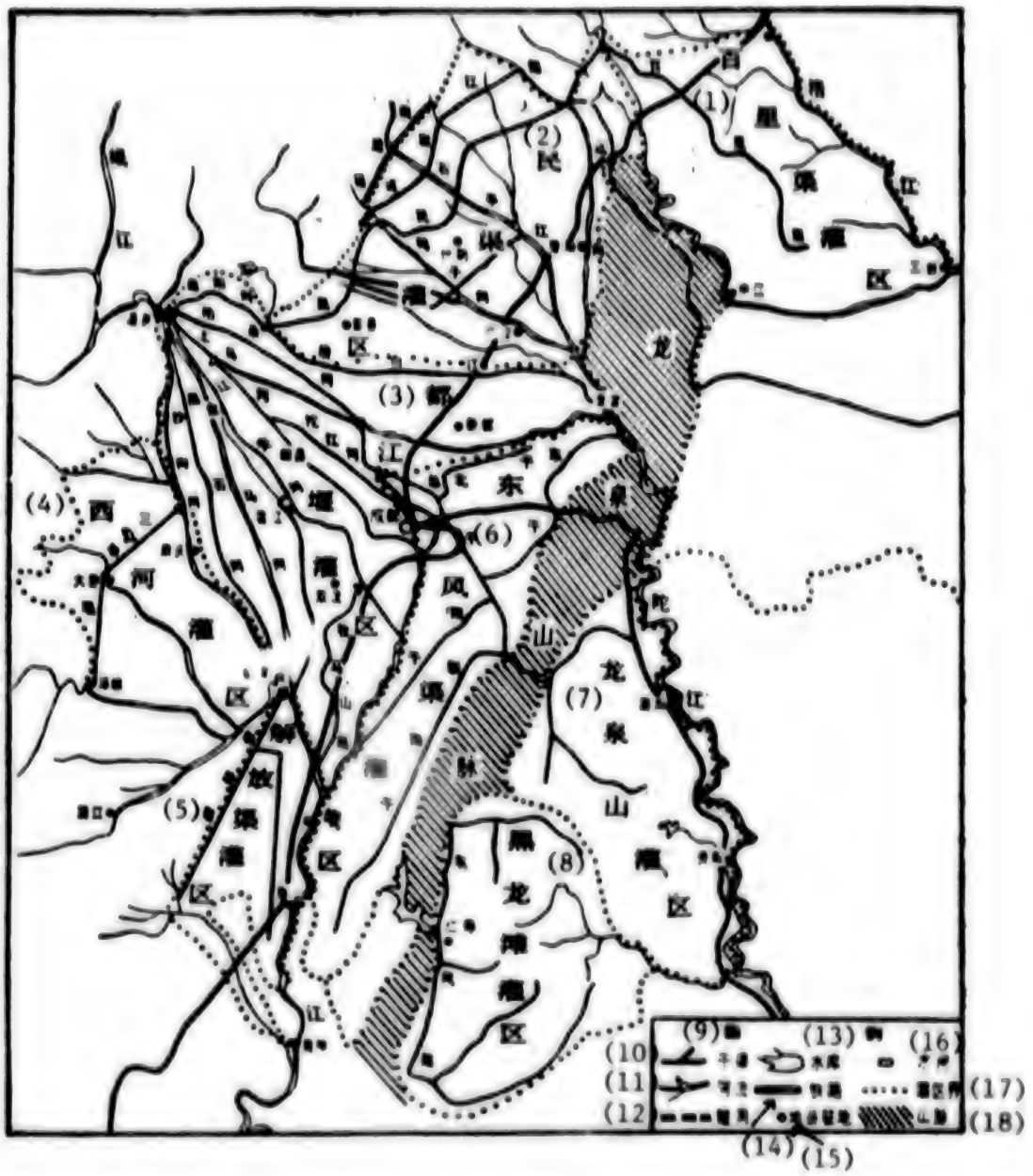


Figure 4-5 Dujiangyan Irrigated Region

Key:

(1) Bailiqu irrigated region
(2) Renminqu irrigated region
(3) Dujiangyan irrigated region
(4) Xihe irrigaced region
(5) Jiefangqu irrigated region
(6) Dongfengqu irrigated region
(7) Longquanshan irrigated region
(8) Heilongtan irrigated region
(9) Legend
(10) Dry canal
(11) River
(12) Tunnel
(13) Reservoir
(14) Railway
(15) Local and county capitols

of fertilizers is high, the management level is high, therefore the level of production is generally higher than that of other regions in Sichuan Province. In 1973, the total yield of food grains was 11.6 billion jin, the highest level in history, the unit yield of food grain land per mu averaged 908 jin (the average of the province was 582 jin), the per mu yield of the sowing area was 482 jin (the average of the province was 337 jin). In the region, there were 8 counties and cities with a multiple planting index surpassing 200 percent, the per mu yield of cultivated land of food grains surpassed 1,000 jin. The per capita farming population had an average of 850 jin of food grains, each laborer produced an average of 1,860 jin (the average of the province was 1,418 jin). In 1973, the amount of commercial food grains provided by the region is the most important commercial food grain base in the province. But in recent years, the population in this region has increased rapidly, the consumption in this region has increased, therefore the commodity percentage of food grains has correspondingly dropped.

In the future, the following aspects must be grasped well to increase food grain production and better develop the function of this region as a commercial food grain base:

1. Further Perfecting Water Conservancy Construction in Farmland

The flat land must gradually realize strip fields, eliminate encircled wasteland and ancient low banks between fields. These measures can expand the area of cultivated land by 5 percent. These should be combined with construction of strip fields, digging of drainage ditches, adjustment of the canal system, separation of drainage and irrigation, reduction of the level of underground water, control of rivers to utilize the river beaches to create fields, expand the planting area (in the Wenjiang region alone, it is estimated to be 300,000 mu). In the regions of shallow hills, emphasis should be on reforming the winter paddy fields, in regions deficient in water sources (such as Jintang in the east), the problem of water source must first be solved. In western Qionglai, Fujiang, Dayi, these can be carried out in combination with controlling of Linxi River. After the problem of water source has been solved, ditches must be dug to drain the water, cold waterlogged water must be blocked out, the level of underground water must be reduced, flood irrigation and irrigation by channeling water along furrows must be stopped and shallow irrigation, drying the land must be implemented, the water, heat, aeration and fertilization of the soil must be improved, thus changing single cropping fields to double cropping fields.

2. Open Up Sources of Fertilizers, Use and Nurture the Fields

At the beginning of the founding of the nation, this region mainly planted green manure as the winter crop. After 1960, because of a shortage of food grains, winter wheat was expanded and rape was planted over a definite area according to the mission of state purchases. Under this condition, the area of green manure and feed continued to be compressed (for example, in the Wenjiang region, the area of green manure constituted only 12 percent), affecting hog raising and the revival of soil fertility. The yield of winter food grain crops constituted

one-fifth of the total yield of food grains, the consumption of fertilizers constituted one-half. Also, to take care of early and intermediate rice, there is little fertilizer remaining by the time of planting of late rice. This is one of the reasons that the yield of late rice cannot easily be increased. In the future, to increase the percentage of utilization of land, to seize high yields in every season, the amount of fertilizers must be greatly increased, nurturing of the land must be actively carried out, utilization and nurturing of land must be combined, and sources of fertilizers must be opened up in many ways. First, hog raising to accumulate manure must be developed. The key is to develop the production of feed. To avoid competition with food grains, interplanting and companion planting can be done to increase the yield of feed, some of the ponds and winter paddy fields can also be utilized to develop aquatic feed. Second, green manure must be expanded. Attention must not only be paid to the competition between green manure and winter food grain crops, but must also be paid to the fact that green manure can stimulate increases in production of late food grain crops. Winter crops must be rationally arranged to assure the appropriate proportion of green manure and feed to benefit coordination of the relationship between agriculture and livestock. The source of fertilizers must be increased, the fertility of the land must be nurtured, early transplanting of early rice must be assured to realize high and stable yields. Also, the utilization of methane must be realized and the sources of fertilizers must be expanded. In recent years, the utilization of methane has been carried out in a big way in Mianyang and Zhongjiang. This has conserved stalks for fuel and reduced felling of forest wood, expanded the sources of fertilizers, improved the quality of fertilizers, and should be advocated and popularized to gradually realize "the use of methane on a wide scale." Finally, the method of application of fertilizers must be improved. For example, the Guanghua Commune in Meishan County in this region created the "all layer application of fertilizers." Various kinds of farmhouse manure and chemical fertilizers were applied in the soil evenly when the soil was upturned. Then the soil was finely raked so that the fertilizers were fully mixed with the soil of the plowing layer. This can reduce loss of fertilizers, the strength of the fertilizers is not harsh and not deficient, and it can be supplied ceaselessly to the needs of each stage of growth of the crops. This serves a good function in preventing lodging and reducing disease and insect pests

3. Improve the Planting System

According to past experience and practice in the utilization of cultivated land, planting of double season rice in paddy fields in this region must pay attention to strictly grasping the appropriate sowing times of early and late rice before the goal of increasing yield can be realized. Early rice must be sown after the daily average temperature has risen steadily to 12°C before germination can be assured. This means grasping the "cold tail and the warm front" when the cold front is about to pass for sowing, or using plastic thin sheets to cultivate seedlings, or using chemical agents to increase the temperature of the surface of the soil, thus avoiding rotting seedlings and dying seedlings. Late rice can normally head, flower and fruit when the daily average temperature is higher than 20°C. The safe heading and flowering period of late rice in this region is before 10 September in the north and before

20 September in the south, thus the sowing period of intermediate maturing late rice is during the middle 10 days of June, that of the late maturing varieties is at the end of May, and transplanting must be completed by the last 10 days of July, otherwise the method of "planting the seedlings temporarily elsewhere after removal from the nursery" must be practiced. Reforming the planting system in dryland mainly involves popularizing interplanting and companion planting, changing single cropping and double cropping a year to double and triple cropping a year, changing low yielding crops to high yielding crops, changing late crops to early crops, changing repeated cropping to rational rotational cropping. For example, implementing strip multiple plantings of interplanting and companion planting, companion planting of corn or sweet potato with wheat, interplanting and companion planting of tall and short stem plants can increase the rate of utilization of the nutrients at different depths of the soil and the light energy in the compound colony of the crops and can avoid the conflict of competing for land and fertilizers among the crops.

It is estimated that in the future, combination of building strip fields and creating fields in river beaches can expand the area of cultivated land by 700,000 to 800,000 mu, and about 3 million mu of low yielding fields and winter paddy fields can be reformed. The increases in food grains in this region at the end of the fifth 5-year plan can reach 40 percent by expanding the planting of double season rice in paddy fields, popularizing interplanting and companion planting in dryland, increasing the rate of land utilization, and by improving the conditions of water and soil, increasing the level of scientific planting and hastening the progress of mechanization. The estimates can be even higher. In this way, it is entirely possible to increase the commercial grains by one-fold.

(6) Pearl River Delta

The Pearl River Delta is the major commercial food grain base in the south of our nation. Administratively it includes 27 counties. There are 20 counties that provide more commercial food grains and have greater potential for development.[1] The region's cultivated land and agricultural population constitute 29.1 and 22.4 percent respectively of the province's totals. Per capita agricultural population has an average of 1.32 mu of cultivated land. It is the region in Guangdong Province that has more cultivated land. In 1974, the yield of food grains of the entire region constituted 31.4 percent of the province's total. The per capita agricultural population had an average of 1,064 jin of food grains. Each agricultural laborer produced 2,352 jin of food grains annually. In the same year, there were 12 counties that produced over 100 million jin of commercial grains. According to the analysis of the difference

1. The commercial food grain counties of the Pearl River Delta are: Huidong, Huiyang, Dongwan, Baoan, Boluo, Zhongshan, Doumen, Nanhai, Sanshui, Xinhuia, Panyu, Taishan, Kaiping, Enping, Gaoyao, Sihui, Qingyuan, Zengcheng, Fanyu, and Huaxian, totaling 20 counties.

between purchases and sale of food grains from 1970 to 1974, the average annual amount of commercial grains submitted to the state constituted about 50 percent of the total amount of commercial grains of Guangdong Province. The commodity percentage of food grains was about 25 percent. This region is an important "food grain storage."

The area of paddy fields constitutes 81.1 percent of the area of cultivated land. The sowing area of rice constitutes 93 percent of the total sowing area of food grain crops, dryland grain crops constitute 7 percent. In 1974, was 920 jin [sic], 2.7 times that at the beginning of Liberation, second only to the Hangjiahu Plain. There were 70 percent of the counties that produced a per mu yield of food grains that surpassed the "guideline," 30 percent of the counties produced a per mu yield over 1,000 jin. Increases in food grains over the years have been relatively stable. But the level of production of food grains of each locality is not balanced. In the per mu yields of food grains, the high yielding counties and the low yielding counties may differ by 40 to 50 percent, and the high yielding and low yielding commune brigades may differ by onefold to twofold. The differences among the yields of different types of food grain crops and the different seasons are also outstanding. Generally the yield of early rice is more stable and the yield of late rice is low and unstable. The yields of winter wheat and dryland food crops are not high and are unstable, the average per mu yield is only about 100 jin. The typical high yielding brigades can produce a per mu yield as high as 500 jin, thus it can be seen that the potential for increasing unit yield is great.

The region has a total of 1 million mu of wasteland that can be reclaimed. The area of ocean beaches that can be encircled and reclaimed within a short period is 586,000 mu. The Pearl River valley transports an average of 80 million tons of sand into the sea annually, and annual average silting at the mouth of the Pearl River reaches 7 to 10 centimeters. Outside of Humenkou (Wanqinsha), land extends into the sea at an average rate of 100 meters a year, creating conditions for future reclamation.

The yield of food grains can be further increased in this region mainly via the following ways;

1. Exert Efforts To Improve Productive Conditions, Suit Measures to Local Circumstances To Expand the Triple Cropping System

This is the major way to increase the yield of food grains at present. This region does not have any winters and there is no snow in ordinary years. Heat is sufficient, rainfall is abundant, crops can be harvested three or four times a year. But at present, basically double season rice is planted in the paddy fields, there are only several scores of thousand mu of triple season rice, the multiple planting index of food grain crops is 210 percent, less than the food grain producing regions of the south located at latitudes to the north, and less than the Shantou region in the province. Winter food grain crops (winter wheat and winter sweet potato) constitute only 15 percent of the cultivated land. Large areas of winter fields are used to plant green manure, oil bearing crops, tobacco or left in fallow. Winter planted food grain crops

are few, mainly because the yield of wheat is low and unstable as a result of a shortage of fertilizers, planting and management are not fine, the planting and harvesting seasons are too late, and during the latter period, spring rain continues, there is less sunlight, there are more diseases, fruiting is poor. Rice-rice-wheat can produce 20 to 25 percent more in yield per mu than double season rice if superior varieties can be selected and used, the planting and harvesting seasons can be earlier (preferably sowing between the last 10 days of October and the first 10 days of November, and harvesting between the last 10 days of February and the first 10 days of March), the sunshine conditions in winter can be fully utilized, diseases can be lessened, application of fertilizers can be increased, deep ditches can be dug to drain away waterlogged conditions and reduce soaking, planting can be rationally dense, and the fields can be managed early and finely. In the triple cropping system of rice-rice-potato, the yield of winter potato is not high and is unstable. The yield can be increased greatly if irrigation can be done early, sidedressing can be applied early, intertilling can be done early, insects can be eliminated early. The weak link in triple season rice is [sic] mainly to increase the yields of early maturing varieties of early rice and intermediate rice, to tightly grasp the measures to provide sufficient fertilizers, to produce strong seedlings, to plant densely, to transplant shallowly, to manage early, to eliminate insects, to prevent diseases. The main way to increase the yield of late rice is to increase the application of fertilizers, to utilize early maturing and high yielding varieties and old and strong seedlings or seedlings temporarily placed elsewhere after removal from the nursery to strive towards early transplanting, early management, early maturation to avoid low temperatures during the latter period and to reduce the percentage of empty husks.

In the future, further creating conditions to expand the triple cropping system should mainly involve rice-rice-wheat and triple season rice and appropriately arranging a part of the land for potato-rice-rice or rice-rice-bean (broad beans, peas, or soybean) or rice-rice-tobacco (or vegetables), rice-rice-rape (rape). The policy of "taking food grains as the key link, overall development" must be implemented, and using and nurturing of the land and the original planting habits and regional characteristics must be taken into consideration. In actual arrangement, the proportion of the triple cropping system can be larger in the region of encircled fields where there are less land and more people, and the proportion can be smaller in the large sandy fields and parts of the lowland fields where water conservancy has not been established and where there are more fields and less people. At a few places where there are more people and less fields and sufficient water and fertilizers, the new path of four croppings and five croppings a year can be explored.

2. Grasp Tightly the Basic Construction of High and Stable Yielding Farmland Emphasizing Soil and Fertilizers

The soil of the cultivated land of this region is mostly alluvial soil with an appropriate sand and clay. The plowing layer is deep and thick, the content of organic matter and the contents of nitrogen, phosphorus and potassium are relatively rich, especially in the sandy regions of encircled fields, the land is level and expansive, natural fertility is high. According to incomplete statistics, there are about 4 million mu of sandy fields in the Pearl River Delta,

constituting about two-thirds of the province's area of sandy fields. They are suitable for planting rice. Some newly encircled and reclaimed sandy fields can produce high yields even without applying fertilizers. In the cultivated land, there are also 18.6 percent of dryland, 9.3 percent of lowland fields, and 5.3 percent of low, sandy and saline fields and saline and acidic fields (of this, 3.2 percent are single season fields) that need to create conditions to strengthen water conservancy, improve soil and change the low yield situation. In the hilly mountain regions, in general, the soil layer is shallow, the soil texture is infertile, the plots are small and scattered, they are often washed by mountain torrents, the yields are low and unstable. Fixing up the drainage and irrigation system must be combined with efforts to build ditches around mountains, drain cold water, build dams and reservoirs, and control mountain torrents in a big way. At places where conditions are good, efforts should be combined with deep upturning and preparing of the land mixing in mud or sand to improve the soil and to gradually increase the depth of the soil layer. In addition, the paddy and dryland crop rotation system of paddy rice and peanuts or rape can be popularized to nurture fertility of the soil and increase yield.

The wild grown green manure in this region is distributed widely and it can be gathered in all four seasons, the water surface is expansive, the conditions are favorable for developing such aquatic feed and fertilizers as the "three aquatic plants and one duckweed." In the regions along rivers and oceans, there is an inexhaustible supply of river mud, pond mud and pelagic mud. Rice fields near estuaries of large rivers can utilize tidal waters for irrigation to fertilize land, fertilizers can be used to improve the soil. The use of fertilizers to increase yield is the main measure in the future. First, duckweed should be grown in rice fields, vetch should be planted in winter, sesbania and astragalus should be planted in summer and such green manure should be developed in a big way to establish a green manure system centered around pink duckweed so that green manure is available throughout the year and is assured in every season. Efforts should be combined with establishment of the reform of the planting system and perfection of the planting system of "three food grain crops and three green manure crops" (i.e., planting pink duckweed in spring, planting sesbania below rice in summer, planting astragalus in winter). Returning stalks to the fields should be implemented. Hog raising to accumulate manure must be done in a big way. Private domesticated animals can be raised in public pens to assure accumulation of manure. Cattle, sheep and rabbit raising should be started to accumulate manure, and to establish pig and cattle farms near fields in a big way to realize accumulation of manure on site and use manure on site. In the hilly areas of mountain regions, the potential of wild grown green manure should be exploited. In the river network areas in plains and coastal regions, mud fertilizers, pelagic fertilizers and humic and acidic type fertilizers can be produced in a big way. In addition, 18 counties in the region at present already have small chemical fertilizer plants but there is the need to build new ones and expand the present ones further to satisfy the growing needs of chemical fertilizers.

3. Further Do Well Water Conservancy Construction

The topography of this region is level, the river networks are densely distributed, irrigation is developed. Water sources on the ground surface are extremely rich, the flow of the mainstream of the Pearl River and its tributaries is 100 times the amount of rainfall in this region. Since the founding of the nation, after more than 20 years of water conservancy construction in farmland, the capabilities of drainage and irrigation, resistance to drought, tides and salinity have been greatly increased. In 1974, the entire region's irrigated area constituted 73.7 percent of the area of cultivated land. There were 5.56 million mu that realized high and stable yields. At present, the standards of drainage and irrigation and tidal prevention is not high enough, and damage by floods and waterlogging is still the main threat to agricultural production. The high underground water level is the major obstacle to stable and high yields. Big rains that greatly reduce the yield and severe drought that greatly increases yield have become a frequent phenomenon in the production of food grains of this region. The main problem is that the defensive ability of ocean embankments is rather low. The standard of controlling waterlogging is also low. Damage by waterlogging in the lowlands along the rivers in the lower reaches of Xijiang and Beijiang is rather serious. The yield is very unstable because the land cannot be utilized or only one season of crops can be planted a year due to seasonal or constant accumulation of water. At present, the area of paddy fields that have a drainage and irrigation system that has been fixed up throughout the region constitutes 45 percent of the total area. Massive drainage and massive irrigation in the sandy fields, irrigation by channeling water in furrows and flood irrigation are still common. In recent years, because of improper reclamation of slopeland, the loss of water and soil is serious. The river channels of the delta are silted and blocked, the level of underground water cannot drop. In addition, the drought and salinity at some places have not been eliminated. In the coastal regions, there are still 700,000 to 800,000 mu of rice fields that are threatened by salty tides in winter and spring, affecting timely sowing and increasing yields.

In the face of the major problems mentioned above, the direction of water conservancy construction in the future in this region is as follows: In flood prevention, the policy of "prevention as the main method, to prevent floods, keep flood waters, control (rivers), divert (floods)" together should be implemented, river and ocean embankments should be elevated and strengthened according to higher standards, the ability to prevent floods and prevent tides should be increased, embankments and floodgates should be built in flooding regions and newly reclaimed regions. At the same time, the river system of Xijiang and Beijiang and their tributaries should be simplified, the river beds should be dredged, flood diversions should be built to intercept the flow, the winding flows should be straightened, mountain torrents should be further controlled, the gain and comprehensive utilization of irrigation and flood prevention should be expanded. In controlling waterlogging and prevention of soaking, efforts should be combined with farmland basic construction to fix up the drainage and irrigation system, expand connected encirclements and build floodgates, realize "three separations," i.e., intercept torrents by encircling mountains, separate flooding and waterlogging, separately store and drain water,

separate the high and low, fix up the system of ditches in the fields to separate drainage and irrigation, build garden fields in an overall plan with ditches, trenches, roads, forests, bridges and floodgates. In low sandy fields, emphasis should be placed on developing low level water pumps to use drainage to reduce waterlogging. While reducing floods and waterlogging, irrigation should be developed by suiting measures to local circumstances, suiting measures to expand cultivated land and increase the ability of irrigation mainly by continuing to build systems, dig for potential, rebuild and develop small scale water conservancy projects.

4. Further Increase the Level of Agricultural Mechanization

This region is the key construction region of Guangdong Province. At present, farm machinery power constitutes 62.2 percent of the total of the province (each mu has 1.53 horsepower of agricultural machinery power). The area planted by machine constitutes 35 percent of the area of cultivated land. The amount of chemical fertilizers used per mu averages 94 jin. The processing industry of agricultural products is developed, technical force is stronger, there is a better material and technical foundation. But the area of cultivated land worked by each laborer in the region is larger (generally 3 to 4 mu; it can rea reach 10 mu in the sandy fields), and labor shortage during the farming season is severe, affecting the development of the potential for increasing production. Thus hastening the progress of agricultural mechanization is the important condition for increasing the labor production rate and the yield of food grains on a large scale. For example, in the sandy fields, generally the efficiency of machine plowing is higher than that of draft cattle by 30 times, each mu can produce an increased yield of food grains of 80 to 150 jin. According to the characteristics of this region with a developed river network and abundance of paddy fields, medium and small sized machinery is most suitable. At present, machinery for plowing, raking, harvesting, threshing, crushing, drainage and irrigation, transportation (especially dredging boats) and for processing of agricultural products is needed most. Such farming machinery as transplanters, seedling movers, sowing machines for various crops, tillers, dryers, deep layer fertilizer applicators and trench diggers should be rapidly developed and manufactured, and the repair network of farm machinery should be actively established and perfected in farm villages.

3. Improve the Northern Commercial Food Grain Bases With a Lower Production Level

The northern commercial food grain bases that are national in character but with a lower level of production are: Songnen Plain of Heilongjiang, central plain of Jilin, Sanjiang Plain, Houtao irrigated region of Nei Monggol, Ningxia irrigated region, Hexi Corridor in Gansu and Guanzong Plain of Shaanxi. These are all surplus grain regions formed before Liberation. Some had already become major grain producing regions as early as the Han and Tang dynasties. The proportions of this type of bases among the national bases are as follows: They constitute 24.6 percent of the agricultural population, 49.8 percent of the cultivated land planted with food grain crops, 38 percent of the sowing area of food grain crops, 32.8 percent of the yield of food grains, 46.1 percent of the amount of grains purchased by the state.

The common characteristics of these grain regions are as follows: There is more land and less people, each agricultural laborer works 10 to 30 mu of cultivated land, planting is not refined, the unit yield of food grains has not reached the "guideline" but is even lower than the national average. But because the consumption of food grains at the locality is less, [illegible]re they provide more surplus grains, the commodity percentage of food grains is far higher than that of the various southern food grain bases, generally reaching over 30 percent. Especially in the northeastern region, there are over 50 counties in Heilongjiang and Jilin provinces that provide over 100 million jin of commercial grains a year. In the northwest, the production level is lower than that of the northeast and the per capita average of land is less than that of the northeast, therefore surplus grains are few.

The productive conditions of this type of bases are not as good as those of the southern bases. Although the water conservancy facilities already have a definite foundation, the northwest regions do not irrigate properly, the drainage system is not systematic, and frequently, large areas of cultivated land become saline and waterlogged, and basic farmland construction centered around water conservancy must be further developed, sources must be opened, the flow must be conserved, water resources must be rationally utilized, drawing of water must be strictly controlled, drainage capabilities must be increased, application of fertilizers must be increased, saline and alkaline land must be improved. Because these bases are situated in the north, heat conditions are poorer than those in the south, the average multiple planting index is 109 percent, basically one crop a year. But at some bases, the frostless period lasts for more than 200 days, therefore, multiple planting can be increased by improving the cropping system. At present, sowing and harvesting seasons of the various crops are relatively concentrated, the burden of the labor force is very heavy, therefore, the demand for mechanization is very urgent. These bases have mostly a level topography, the conditions for using large sized agricultural machinery or horse drawn farm implements are good, the level of machinery equipment is higher than that of the south, and further elevating the level of mechanization is still an important measure to increase the yield of food grains.

Within the regional boundaries of these bases, there are many state run farms which are the important forces of food grain production. In the future, grasping well the construction of the state run farms will serve greatly in the construction of the commercial food grain bases. Also, in these bases, there are more wasteland resources suitable for farming, the potential for development is great, and in the future, large scale increases in the production of food grains can be realized within a short time by strengthening the equipment of farm machinery and by planned development by the state run farms and the people's communes in separate directions and by building water conservancy projects.

(1) Songnen Plain

The Songnen Plain of Heilongjiang Province is our nation's "big northern storage" that provides the most commercial food grains. Administratively it includes:

all of the 3 regions of Songhuajiang, Nenjiang, Suihua, totaling 34 counties. Concentrated here are 46 percent of the agricultural population and 54 percent of the cultivated land of the entire province. In 1974, per capita agricultural population had an average of 5.2 mu of land. It is a region with more land and less people. The entire region spans the two banks of the Songhuajiang and its tributaries, the Nenjiang and Hulan River. Most of the land is a wavy plain. The elevation is 130 to 200 meters above sea level. The soil texture is mainly chernozem. The humus layer is over 0.5 meters and rich in humus. The granule structure is good and natural fertility is high. There is a lot of wet land on the two banks of the rivers. The soil is meadow bog soil. The topography in the northern part is high, there are many shallow hills and mounds, in the east there are mountains and valleys, and the relative differences in height is large. Chernozem and brown forest soil are distributed in a mixed fashion. In the west there are piles of sand and wind. Between the sand dunes there are pools of water forming pockets and reed ponds, and the soil is mainly meadow carbonate chernozem. The soil is infertile and fertility is low.

This region is located north of 45°N, winter is long and severely cold. There are 5 months of monthly average temperatures below 0°C. Each year, freezing begins in November. When the cold front arrives, the temperatures can drop to -41°C. Accumulation of snow lasts for 2 to 3 months without melting. Frost occurs in May, and the first frost occurs during the middle and last 10 days of September. The frostless period lasts only 125 to 150 days. The cumulative temperature $\geq$ 10°C is only 2,500°C. Winter planting is difficult. The multiple planting index is only 98 percent. The summer planting season is also very short. Sowing in the large fields in May requires that spring wheat and corn be completely planted within 10 days about 5 May. "Time is food grains." Facts of many years have proven that bumper harvests can be realized in years when spring arrives early and the cumulative temperature is high. On the other hand, poor harvests will occur 9 out of 10 times in years when spring arrives late and the cumulative temperature is low. The annual rainfall is 500 to 700 millimeters, mostly concentrated between July and September. Distribution of the seasons is not even, the annual change is great (for example, in Harbin, the average annual rainfall is 570 millimeters, in the year of most rain, it can surpass 1,000 millimeters, in the year of least rain, it will be less than 350 millimeters), thus drought and waterlogging are frequent. According to records from 1949 to 1973, of the 24 years, there were 8 years of drought, 6 years of spring drought and autumn waterlogging, 2 years of spring drought, autumn waterlogging and low temperatures, 5 years of waterlogging, only 3 years without disasters. In most of the places in this region, the more outstanding and common problems are low temperatures, spring drought and autumn waterlogging. Low temperatures and early frost affect agriculture greatly. For example, in 1976, low temperatures occurred in August, deep frost occurred in September, the active cumulative temperature for the entire year was less than that of ordinary years by 220°C, food grain production was reduced by one-fifth from that of 1975. The rainy season was overly concentrated in summer, and this is also unfavorable to agricultural production. The amount of rainfall in July and August during the season of harvesting wheat constitutes 60 percent of the amount of rainfall of the entire year. Because of the abundance of rain water,

the moisture in the soil becomes saturated, the soil becomes muddy, tractors cannot operate, harvest and transporting the harvest are not possible, the farming time is delayed, a massive amount of food grains is lost, and frequently there is a bumper yield but there is no bumper harvest. For example, 1972 was a year of extra big flooding in Heilongjiang, 45.8 percent of the wheat fields could not be harvested in time because of rain, over 100 million jin were lost, 61.5 percent of the soybean fields could not be harvested that year, they were buried under snow and harvested in spring of the following year, and 200 million jin were lost.

Because the foundation of water conservancy in farmland is relatively weak, the ability to resist natural disasters is low. Over the years, the unit yield of food grains has been low, the total yield has been unstable. During the 24 years from 1949 to 1973, there were 9 years of bumper harvests, 7 years of poor harvests, 8 years of average harvests, and the difference in the yields of food grains between the years of bumper harvest and poor harvest could reach as much as 1 billion jin. In 1974, the year of the highest yield of the past, the total yield of food grains was 16.5 billion jin (constituting 67 percent of the total of the province), the average unit yield was 250 jin, far lower than the production level of the commercial food grain bases in central China, and also lower than the national average.

Also, this region has less people and more land, the burden upon labor is heavy, agricultural operations are relatively simple and unrefined. Although the natural resources are rich, up to the present time diversification is still not developed. The sowing area of food grains constitutes 92 percent of the total sowing area. Food grain production is mainly dryland food grains. The area of corn constitutes about 30 percent of the sowing area. Sorghum which was originally planted the most, was easily damaged by early frost, and the unit yield was low, so it has been gradually replaced by corn. Winter wheat can tolerate low temperatures, and in recent years, its proportion has increased more rapidly. Especially in the northern regions, it constitutes about 14 percent. As water conservancy develops, planting of paddy rice has also expanded and is concentrated in the counties on the south bank of the Songhuajiang and the middle reaches of the Hulan River. Soybean is this region's traditional crop, its proportion in the plains can reach 20 percent. The proportion of economic crops of this region is not high (only constituting 2 to 3 percent of the sowing area). But the commodity percentage is very high. For example, the sowing area and yields of beets, flax and sunflower lead all the provinces of the nation. Beets and flax are concentrated along the two sides of the railroad, and this region is our nation's major production base for beets and flax.

The unit yield of food grains of this region is not high (the average in 1974 was 250 jin), but the per capita average of land is higher, therefore each person has 1,000 to 1,500 jin of food grains, higher than the national average. In 1974, the amount of food grains purchased by the state from the entire region constituted 62 percent of the total of the province, the commodity percentage reached 35 percent, and there were 24 counties in the region that submitted over 100 million jin of commercial food grains.

This region is historically famous as the "great northern wasteland." It has a lot of wasteland resources suitable for farming. Since Liberation, because of the building of the state run farms, planned reclamation by the construction corps for production and the scattered plantings by cooperatives and communes, the area of cultivated land increased 15 percent over that at the beginning of the founding of the nation. Viewing future development, to further build this commercial food grain base well so that the "great northern storage" can contribute more, walking on two legs is still necessary. The unit yield of cultivated land at present must be increased by finding ways from many aspects. At the same time, unified planning must be done to further develop the wasteland resources which have better conditions and which are suitable for farming. The potential in these two aspects are both great. After surveying the wasteland in recent years, it has been found that there are still 2.8 million mu of first and second category wasteland that have better conditions and are suitable for farming within this region. If these can be developed and utilized within the next 10 years, the total area of cultivated land can reach 70 million mu. At present, the unit yield of food grains of the entire region is not high, but a few advanced communes and brigades have already produced over 700 jin, even surpassing 1,000 jin. Looking at the future of the unit yield of food grains of the entire region, and calculating at 400 jin, the total yield of food grains at the end of the sixth 5-year plan can reach 28 billion jin, the commodity percentage, still calculated at 40 percent, will provide 11.2 billion jin of surplus food grains a year, a onefold increase over the present amount.

Based on the original foundation of food grain production in this region and the main problems existing at present, the future development must grasp well the following aspects.

1. Strengthen Basic Construction of Farmland and Water Conservancy, Increase Ability To Resist Natural Disasters

Since the northern agricultural conference in 1970, all places utilized "winter rest" to concentrate labor, animal and machinery forces to carry out basic farmland construction in a big way. Strip fields and square fields were built in plains, ditches were dug, silt was removed, and drainage ditches and canals were dug in lowland regions which easily become waterlogged. In the areas of mounds and slopeland, terrace fields were built to retain water and soil, changing "fields" of the three runs" into "fields that preserved the three." Great achievements have been realized. But at present, the weak link is still water conservancy. The presently irrigated land constitutes less than 3 percent of the total area of cultivated land. There are 40 million mu of land that easily are affected by drought. The region has many rivers, the river surfaces and ground surfaces are about the same height, and there are conditions for drawing water for irrigation. The three 'Zhao' regions along the Songhuajiang (Zhaozhou, Zhaoyuan, Zhaodong) have already created some experience in this respect. At places far away from ground surface water sources, mechanized wells must be sunk to extract underground water. At most places the underground water reserve layer with rich reserves is only 50 to 60 meters deep. Pumping water is more convenient. In the areas of shallow hills and mounds, developing spray irrigation is an important direction. It not only can reduce the work in

leveling and preparing the land, but it conserves the use of water, and the ground temperature can be increased, stimulating early maturation of crops. According to the experience of Hulan County, spray irrigation of wheat fields can produce a per mu yield of 670 jin, spray irrigation of corn fields can produce a per mu yield of 1,130 jin. The increases in yields are 1.5 to 2 times the yield of dryland crops without irrigation. The results are remarkable. This can be greatly popularized. The western part of this region is seriously damaged by wind and sand. Large fields are buried under sand, seeds are blown away. Since 1952, a protective forest belt has been planted from Fuyu County in the north to Zhaodong County in the southeast, connecting 11 counties. After a long period of cultivation, a forest has been built and it has served to protect the fields and stabilize sand. Crops in the large fields in the forest can mature 10 days earlier, unit yield of food grains is onefold that before forestation. In the future, basic farmland construction centered around water and soil and combining soil, water, fertilizer and forests should be widely developed to change the productive conditions on an overall scale.

2. Carry Out Scientific Planting in a Big Way, Stimulate Early Maturation of Crops

Low temperatures, drought, waterlogging, wind and sand are natural disasters, but whether they bring about disaster and the severity of the damage are determined by the level of planting and management. This region's hog raising is not developed (there is an average of one head of hog per 18 mu of cultivated land). Therefore the source of farmhouse manure is not sufficient. In recent years, some advanced units in production (such as the Qianjin Brigade of Hulan County) established a special team to raise hogs and accumulate manure. High temperature manufacture of manure was carried out in a big way, average application per mu was 7,000 to 8,000 jin, the increase in yield of food grains per mu reached over 700 jin. In the face of the bad habit of wide planting and meager harvests left over historically in this region, technical measures of interplanting, wide sowing, rational dense planting have been popularized actively in recent years. Because of the characteristics of spring drought, early frost in autumn, short growth season, early maturing high yielding varieties should be popularized, measures should be suited to circumstances to sow seeds timely and early, crops with a long growth period should be stimulated to mature early (such as forced budding and transplanting in water of corn seeds, transplanting of early paddy rice seedlings with soil attached, etc) to assure full seedlings at once and to prevent autumn frost early. After the problems of soil, fertilizer and water have been solved, rational interplanting and dense planting must be grasped, such as interplanting of corn and wheat or wheat and soybean and such tall and short plants to allow aeration and light permeability. Each day, 1 hour more of sunshine should be utilized, the results will be good and per mu yield can surpass 1,000 jin. All of these effective experiences in scientific planting need to be advocated and popularized over greater scope.

3. Hasten Progress of Mechanization

In this region, each farm laborer works an average of 27 mu (in the north where there are less people, each works over 70 mu), therefore planting is not refined, the level of management is poor. Although there is a definite

number of draft animals and farm machinery, each head of draft animal works an average of 57 mu of cultivated land (in the north, over 90 mu), agricultural machinery does not come in full sets, repair and maintenance cannot catch up, and less than half of the tractors are operational. Therefore, during spring planting and autumn harvests, labor, animal and machinery are all in short supply, often the crops cannot be harvested and transported back to the drying fields in time, creating a situation where there is a bumper yield but there is no bumper harvest. In the future, as efforts are directed towards broadness and depth in production, the problem of the shortage of labor, animals and machinery will become more outstanding, therefore hastening the realization of mechanization has become an important problem that needs to be solved urgently.

(2) Central Plain of Jilin

There are 11 counties connected in the plain on the two sides of the Harbin-Dalian Railway in central Jilin. Each year, each county provides over 100 million jin of commercial food grains. It is another important commercial food grain base of the northeast. The natural conditions and socioeconomic conditions are similar to those of the Songnen Plain. The problems existing in the production of food grains at present and the measures to be taken for future development are also similar to those of the Songnen Plain. They will not be repeated here. The per capita farming population in this region has 4.9 mu of cultivated land, slightly less than that in the Songnen Plain, but far higher than each of the commercial food grain bases in central China. Agricultural labor and agricultural machinery have a heavier load (each laborer works about 20 mu, each tractor works about 5,400 mu), therefore planting is not refined. At present, the cultivated land is not fully utilized, the multiple planting index is only 97 percent. Basically it is one crop a year without multiple planting. In 1974, the unit yield of food grains (about 290 jin) was slightly higher than that of the Songnen Plain, but still lower than the national average. There are less people and more land in the region, therefore there are more surplus grains, and the commodity percentage of food grains reached as high as 36.4 percent, leading all other commercial food grain bases. Individual counties in the region such as Yushu County produced a per mu yield reaching the "guideline," and over 700 million jin of commercial grains were provided a year, also leading all counties of the nation, the commodity percentage of food grains reached 46.6 percent. In 1974, this region provided over half of the total commercial food grains of the entire province. Its importance can thus be seen. In future development, the key measure of agricultural mechanization must be grasped well. At the same time, basic construction of water conservancy in farmland must be carried out in a big way to increase the present rate of utilization of cultivated land. Wasteland which has better conditions and which is suitable for farming should be reclaimed according to plan, the planting area should be expanded, and scientific planting should be advocated to implement fine planting.

(3) Sanjiang Plain

This is the low plain at the confluence of the Heilongjiang, Songhuajiang and Ussuri River in eastern Heilongjiang Province. Administrativley it includes the

3 provincial cities of Hegang, Shuangyashan, Jixi, 15 cities and counties in the Hejiang region, and 4 counties in the Mudanjiang region, totaling 22 cities and counties, and 54 farms under the jurisdiction of the 4 administrative bureaus of state run farms of Jianshanjiang, Baoquanling, Hongxinglong, Mudanjiang, and the 7 regional state run agricultural and livestock farms. The total area of land covers 103,500 square kilometers, constituting one-seventh of the province, the plains constitute 60 percent, hilly regions constitute 9 percent, mountain areas constitute 31 percent. The region is a newly developed region with more land and less people. At present, the reclamation index is only 20.4 percent. The potential for expanded cultivation and increased yield is very great. In 1975, the cultivated land was 31.5 million mu, an expansion of 1.14 times over that in 1949. Per capita agricultural population had 8.1 mu of cultivated land and each laborer worked an average of 35.1 mu, slightly higher than the provincial average. The agricultural population constitutes one-fifth of the provincial population. The labor force, cultivated land, sowing area and yield of food grains all constitute one-fourth of the province's totals. The commodity percentage of food grains and beans reached 45.3 percent, the commodity percentage of the state run farms reached as high as 60 percent, the people's commune reached 34.4 percent, the amount of state purchases of food grains and beans constituted 29.6 percent of the total of the province. It is a newly built and important commercial food grain base of our nation after Liberation. At present, state run farms are distributed throughout the region, the area of cultivated land constitutes 49.8 percent of the total region, the yields of food grains and beans constitute 42.9 percent, the commercial food grains submitted to the state constitute 55 percent, the degree of agricultural mechanization has reached above 70 percent, highways are plentiful, and the Fuqian Railroad being built crosses the heartland of the Sanjiang Plain. All of these have important political and economic significance in building the border regions, in creating prosperity for the border regions, and fortifying national defense. This has also created good conditions for overall management of the Sanjiang Plain and for building and further developing this commercial food grain base in the future.

This region possesses superior conditions for agricultural production. On the west is the Xiaoxinganling and the Wandashan mountain region. The topography slants gradually from the southwest to the northeast, the region of the plain is generally 50 to 60 meters above sea level, the lowest is the Fuyuan Delta which is only 34 meters above sea level, and generally the slopes are between 1/10,000 and 1/30,000. The land is centralized and in expanses, beneficial to operation of large sized machinery. In climate, sunshine is sufficient, summer is warm, there is more rainfall, the combination of heat, light and water during the growth period of crops is good, the frostless period is 120 to 140 days, it is suitable for planting spring wheat, soybean, corn and paddy rice. The river network in the region is developed, water sources are abundant, except for the 3 large rivers, there are also the Wokenjiang, Muling River, Anbang River, Bielaqi River, Qixing River, Naoli River, etc, totaling 10 rivers originating in the western mountain regions. The ground surface runoff averages 13.1 billion cubic meters over the years. The conditions to assure water sources are good. The soil is mainly burozem, black soil, planosoil, meadow soil and bog soil. The surface is generally covered by a deep and thick layer of black

soil as the plowing layer. The nutritional content is high. The masses say: "The black soil is oily and rich, without manure it can also produce grains." This shows the soil texture is superior, but the physical properties and natural fertility of the various types of soils are not uniform, reclamation and utilization require different farming measures to fortify and increase the good soil structure and fertility and assure stable and high yields of agricultural crops. According to surveys, this region still has 43 million mu of wasteland that can be reclaimed. At present, of the various types of soils, the degree of reclamation of black soil is the highest, followed by meadow soil and planosol, and burozem and bog soil are developed the least. Therefore, in the eastern region where the major natural geographical scenery is swamps and swampy wasteland, controlling waterlogging and drainage are the foremost problems in future reclamation and expansion of cultivation.

In 1975, the food grain crops of this region constituted 92 percent of the total of the sowing area, wheat, soybean and corn constituted 76.4 percent, per mu yields were all higher than the provincial average. This region is the concentrated wheat, soybean and paddy rice producing region in Heilongjiang. The sowing area and the yield all constitute one-third of the province's total. The varieties of food grain crops of this region are relatively simple. The region is characterized by specialized concentrated production. The degree of agricultural mechanization of state run farms is high. Wheat and soybean are planted over more land. The people's communes have a larger labor force, therefore the proportion of paddy rice and corn is greater. But generally speaking, the production of food grains in this region is still not high and is unstable. In 1975, the average per mu yield of food grains was only 263 jin. The farms were developed relatively late, the proportion of lowlands is high, per mu yield is lower, and changes are greater. All of these affect the stability of the commercial grains provided by this region.

Flooding and waterlogging, low temperatures, drought, leaching, wind erosion are the natural factors that cause the yields of food grains of this region to be low and unstable. Of these, flooding and waterlogging are the main conflicts. Their frequency of occurrence is large, the scope is wide, the area of cultivated land easily waterlogged in the entire region constitutes 45 percent of the total cultivated land. In the eastern low plains, there are expanses of unclaimed planosol, meadow soil and swamp wasteland. They frequently accumulate water seasonally or in the whole year. The rainfall in this region is 500 to 700 millimeters, there is more rain in the mountain regions than in the plains, rainfall in July and August constitutes 50 to 65 percent of the total amount of annual rainfall. Each year, there are two high water periods in autumn and spring, generally autumn high waters are bigger than spring high waters. Because the slopes are steep and the flow at the upper reaches of the rivers in the region is rapid, the river channels at the middle reaches are winding, the cross section is narrow, the specific drop is gradual, at the lower reaches, backwater blocks the flow, therefore, during the high water periods, mountain torrents overflow and gather in lowlands throughout the year, preventing rain water of that year in the plains to drain away during the current year, and in agriculture, this forms autumn waterlogging, spring waterlogging and waterlogging during the harvesting time of wheat and such "multiple waterlogging" phenomena. Autumn waterlogging mainly affects the maturation of

autumn crops such as soybeans and corn, the maturation is delayed, preventing autumn harvest and autumn upturning of the soil (in October, the ground surface begins to freeze). This not only causes serious reduction in the yield of the current year but also the yield of wheat in the second year is frequently affected because of spring waterlogging in the next year. Therefore there is the saying: "Autumn waterlogging in one year causes disasters in 2 years." Spring waterlogging extends autumn waterlogging and is also related to big winter snow and overabundance of spring rain. It mainly affects spring sowing, in lighter years, the sowing period of wheat is prolonged and the yield is l- r. In more serious years, large amounts of cultivated land cannot be sown and are left to waste. Waterlogging during the period of harvesting of wheat is caused by big rains, rainstorms or continuous overcast and rain during the period of harvesting of wheat. The combine cannot operate, causing a situation where there is a bumper yield but no bumper harvest.

Low temperatures are caused by greater changes between years in the growth periods and the cumulative temperatures. The area of disaster is larger. In low temperature years, often a reduction in yield is caused by the early occurrence of early frost, insufficient heat, lower temperatures and more summer and autumn rain, affecting maturation of the autumn crop, and in general, this occurs once every 3 to 5 years. In the region, rainfall during the period from the end of May to the first 10 days of July is not stable enough, spring drought and clutching drought easily occur, most visibly affecting the cultivated land of planosol and burozem on the mounds and slopeland without conditions for irrigation, preventing wheat, soybean, corn to grow and develop normally, causing partial reduction in yield. Leaching mainly occurs on the mountain burozem in the hilly regions, planosol of mounds and black soil on mounds and slopeland. Most of the cultivated land is on natural slopes. When it rains, the surface soil and fertilizers are carried away by water, the area of leaching throughout the entire region constitutes about one-fourth of the total cultivated land. Wind erosion is most visible along the line from Jiamusi to Raohe. Leaching and wind erosion gradually carry away the black soil of the surface layer and fertilizers, causing the plowing layer to become infertile and thin, and in addition, the localities do not place enough emphasis on planting and nurturing the land, application of organic fertilizers and scientific planting. The fertility of the cultivated land of the entire region shows a common decreasing trend. All of these are problems that need to be solved urgently.

To overcome the unfavorable effects of natural conditions upon agricultural production in this region, the policy of suiting measures to local circumstances, overall planning and comprehensive control must be carried out to actively change the basic conditions of agricultural production in the Sanjiang Plain and to build high and stable yielding farmland that can be assured of producing harvests in drought and waterlogged conditions. The key to completely eliminating drought and waterlogging is uniform arrangement of the middle and lower reaches of the rivers in the efforts to dredge each river and to combine the large, medium and small projects in adjustment and conservation, to combine major construction and field construction, to combine control of waterlogging and control of drought, to combine control of water and improvement of soil, and to implement comprehensive management of soil, water, fertilizers, forests.

Strip fields and terrace fields should be built and protective forests should be planted so that fields, ditches, forests and roads are comprehensively systematized to control damage by leaching and wind erosion. The flat land must be deeply upturned, the soil must be improved, application of organic fertilizers must be increased, green manure must be planted, the yield of food grains must be increased. Efforts should begin from the actual conditions of the amount of heat and the frostless period of each locality in the region in the use of early and intermediate maturing varieties to rationally couple them to avoid or lessen damage by low temperatures. Also, the standard of the quality of highways must be improved to assure that the roads can be traveled in rain or shine to facilitate traffic and promote the development of production.

This region is not only one of the important commercial food grain bases of the nation but in the future it is also an important region of reclamation of wasteland and expansion of cultivation. After implementing the main measures of treatment described above, the potential of the cultivated land for production presently available can be exploited. They will create conditions for overall development and especially reclamation of wasteland and expansion of cultivation. It is estimated that the yield of food grains and the commodity percentage of food grains and beans of this region will increase greatly and the function of this region as a commercial food grain base will be developed day by day.

(4) Houtao Irrigated Region

Situated in the western part of the Nei Monggol Autonomous Region, it includes the two banners of the Bayan Naor League north of the Yellow River bend and south of Yingshan (Hangjinhou Banner and Wulate Qian Banner), three counties (Wuyuan, Linhe, Dengkou). The area of land is over 10,000 square kilometers. It is a plain formed by alluvial silting and sedimentation of sand and mud from the Yellow River and its tributary Wujia River. As early as the Han and Tang dynasties, soldiers had already reclaimed this land and later it served for a long time as the grazing fields of the northern nomadic nationalities. Large scale reclamation began at the end of the Qing Dynasty to draw water from the Yellow River for irrigation and develop agriculture. After Liberation, water conservancy facilities have been continuously improved. Today, canals and channels are everywhere, farmland is expansive, and the region has become an important "rice storage north of the Great Wall."

The main food grain crops of this region are wheat and cereal grain, followed by corn. Paddy rice is scarcely planted. Because of the gradual improvement in water conservancy conditions, the assurance of irrigation of farmland is high. In 1971, the area assured of irrigation constituted over 90 percent of the total area of cultivated land. But the level of food grain production was still low, total yield remained at about 750 million jin for a long time. From 1966 to 1967, the yield once surpassed 870 million jin, but dropped again. In 1971, the per mu yield of cultivated land of food grain crops was only 212 jin, lower than the level of all commercial food grain bases of the nation, and even lower than the national average by 92 percent. Until now, the area of high and

stable yielding farmland constitutes only 8.9 percent of the total area of cultivated land. The commodity percentage of food grains dropped from 36 percent in 1965 to 22 percent in 1972.

This region is level and suitable for machine farming. The soil is fertile, there is more land and less people. In 1971, the per capita agricultural population averaged 5.2 mu of cultivated land, about the same as that in the Songnen Plain in the northeast. There are still 843,200 mu[1] of wasteland suitable for farming that extend in expanses of over 1,000 mu. The potential for increasing the rate of utilization of cultivated land and expanding the cultivated land is still great. At present the major problem existing in production is that secondary salinization and alkalization occur in the soil commonly, seriously affecting the increase in the yields of food grains. This is mainly because the old society's production methods irrationally utilized water and soil resources. It exercised reckless reclamation of land and reckless drawing of water from the Yellow River. There was confusion of the drainage and irrigation system, a lack of leveling and preparing the land, reckless irrigation at deep places and flood irrigation, irrigation without drainage or more irrigation and less drainage, the canals and channels were constantly blocked, the embankments and dams were broken, allowing water in the canal to flow everywhere, the underground water level rose day after day, the removal of water was mainly by evaporation, thus causing the saline and alkaline land to increase continuously. Second, the central part of this region is a downthrown basin, the topography is low and flat, the slope is small (1/6,000-1/8,000), drainage is difficult in the surrounding mountains and plateaus, and the climate is arid, rainfall is scarce, evaporation is strong, the saline content of the water of the Yellow River is high (0.3 to 0.5 percent). These unfavorable factors also intensify the development of secondary salinization of the soil. Under these natural conditions and because of improper utilization by man, this fertile land has become "a land where drawing water is difficult in drought, water flows everywhere and covers the beaches, the cultivated land changes every year, weeds grow all over the fields." After Liberation, this situation was greatly improved. The irrigated region was adjusted and constructed and definite results have been achieved. But over the past years, flood irrigation and the use of water to replace cultivation and such irrational management methods have not yet been completely changed. Especially after the main trunk canal was opened, because irrigation was convenient, the use of water greatly increased, and under the situation where the drainage and irrigation systems are not coordinated, there was too much irrigation, causing the underground water level to rise, and the problem of salinization has become more serious. According to the general survey of 1958, the area of saline and alkaline land throughout the entire region totaled 600,000 mu. In 1964, this rose to 1.578 million mu. In 1973, this expanded to 3.163 million mu, constituting 58 percent of the irrigated area. Because of the serious salinization and alkalization, land that could not be used for planting and thus abandoned covered

1. Report on the Survey of Wasteland Resources Suitable for Farming in the Region Irrigated by the Yellow River Water in the Bayan Naor League, Nei Monggol and Forestry Planning Team

520,000 mu. The past high yielding places became low yielding land, good land became alkaline beaches. For example, the Minsheng Brigade in Wuyuan County was "a land of splendid grass, and a wheat cellar," now it is "white alkaline, black alkaline, horse urine alkaline, alkaline is found in all pits and low land." At many places "spring is white all over, seeds sown do not become grains, sowing over a big expanse in spring, autumn harvest is only small." To hasten construction of the commercial food grain base, the control of secondary salinization and alkalization of the soil must first be grasped well with all efforts. Summarizing the practice and experience of the people in the irrigated region in their struggle against salinization and alkalization, there are the following points.

1. Strengthen Comprehensive Drainage Measures, Increase Ability of Drainage

The problem of irrigation and drainage in this region is mainly the inability of irrigation and drainage to become systematic because the ability to draw water is strong but the drainage ability is weak. To prevent further salinization of the soil, irrigation and drainage must be systematized, and the ability of drainage must be increased. First, the problem of the direction of utilization of the Wuliangsu Sea must be determined. The Wuliangsu Sea is located at the eastern end of this region. It is the major outlet for water drained from the irrigated region, receding water and discharge of mountain torrents. In the past, to satisfy the needs of fishery and other aquatic production, water was supplemented to the Wuliangsu Sea from the main trunk canal from 1966 to 1969, causing the water level to remain above the designed water level and seriously blocking the main trunk canal. The largest backwater backed up to 45 kilometers, and of this, the water level of 30 kilometers was higher than the ground surface. Leakage of the two banks was very serious. Salinization of the nearby soil developed rapidly, and agriculture was seriously damaged. To assure construction and development of the commercial food grain base, it must be determined that the major direction of utilization of Wuliangsu Sea is to satisfy drainage of the irrigated region. With the prerequisite that the water level does not surpass the designed water level of 1,018.5 meters, the highest water level in winter is maintained at 1,018.8 meters, the area of the sea is maintained at 378,000 mu, the needs of developing fishery and reed should be appropriately taken into consideration. Second, because of the natural slope of the main drainage trunk canal and the limitation of the water level of the Wuliangsu Sea, the designed vertical slope gradually becomes less steep from west to east, and the speed of flow slows down. Because the quality of construction of the main drainage trunk canal is poor, the designed standards were not reached, the bridges, culverts, aqueducts and such construction that cross the main drainage trunk canal built by nearby communes and brigades often cause the canal to become small, or the main drainage trunk canal is recklessly opened on the side to back up water, thus hastening silting and sedimentation in the canal. These affected draining of the main drainage canal into the Wuliangsu Sea. Therefore, besides dredging the main trunk canal, water elevation stations must be built at the mouth of the main drainage trunk canal into the Wuliangsu Sea to directly lift the water into the sea, and at the same time, the backwater of the Wuliangsu Sea must be drained, and a water elevation station should be built on the Yellow River to drain the water from the Wuliangsu Sea

and the supplementary water into the Yellow River after regulation. Third, hasten the systematization of the drainage system in the irrigated region. At present, only the trunk canal and the large tributary canals have been dug, but only one-tenth of the lateral canals and the farmland canals has been completed. The depth of the trunk and tributary canals already dug has not reached the planned standard. To fully develop the function of the drainage facilities so that they will drain smoothly, drainage construction must be perfected and management should be strengthened.

The main drainage method in the irrigated region at present is the use of exposed ditches. Silting and collapsing of the slopes easily occur, the cost of maintenance and repair over many years is increased, and the development of the function of the construction is also affected. The drainage method of combining shallow ditches and vertical well drainage can be considered. Vertical well drainage does not take up much land, construction is simple, management and utilization are convenient. They can lower the underground water level more quickly,and the effect of preventing salinization of the soil is good. At the same time, at places where conditions are good, well irrigation can be combined with vertical well drainage to supplement the shortage of water in the canals to increase the quality of irrigation. This can be tested at key points, summarized and popularized.

Planting trees and forestation in a big way and strengthening biological drainage are also effective measures to lower the underground water level. Because of leakage in the course of transportation of water by canals, the underground water level slants from the canals towards the farmland nearby, and secondary salinization of soil frequently occurs first along the two sides of the canals and expands. Practice proves that planting trees along the two sides of the canals and massive evaporation of the forest belts can lower the underground water level on the two sides of the canals so that the underground water level slants from the farmland towards the canal, forming a situation opposite to that of places where canals are not lined with forest belts. The effect of preventing and controlling salinization of soil is very visible.

In the improvement of saline soil, measures to move soil, pave sand, plant green manure, increase application of organic fertilizers, planting crops that are tolerant to salinity, and build fields that preserve moisture are also effective besides drainage and planting trees as described above. The cause of salinization of soil is a comprehensive and complex problem. Therefore, improving, preventing and controlling salinization of the soil must also involve the use of comprehensive measures before good results can be achieved.

2. Strictly Control the Amount of Water Drawn To Realize Planned and Rational Use of Water

Since the completion of the Sanshenggong Water Conservancy Hub in 1961 in the irrigated region, the amount of water drawn has increased gradually over the years. During the period from 1954 to 1960 before completion of the project, the annual average amount of water drawn was 3.262 billion cubic meters. The annual gross amount of water per mu was 613 cubic meters. From the time after

completion to 1974, the annual average amount of water drawn rose to 4.321 billion cubic meters, an increase of 32.5 percent over that before completion, and the annual gross amount of water per mu increased 30.2 percent, higher than the quota of 550 cubic meters per mu of irrigated water per year stipulated by the local water conservancy department by 45.1 percent. Each year, excess water filtered underground amounted to about 700 to 800 million cubic meters, causing the underground water level to rise. At present, the annual average underground water level in the irrigated region is about 1.5 meters. After every autumn irrigation, the water in most of the regions is only 1 meter deep, at some places it is as high as the ground surface. Therefore, the amount of water for irrigation must be strictly controlled according to the rational quota for irrigation and based on the needs of the growth of crops to realize rational and planned use of water. These are effective measures to completely control "ascites" and "saline and alkaline disease."

The present annual gross amount of water for irrigation per mu of 798 cubic meters must be gradually reduced to the quota of irrigation of 550 cubic meters year by year, the drawing of water must be limited, and also, the canal system must be completed in basic farmland construction. At present only 30 percent of the main canals, tributary canals, lateral canals and farmland canals are complete. The area with complete systems completed according to the standards of the plans constitutes only 5 percent of the present area of irrigated area. The various construction work below the level of tributary ditches is still mainly straw floodgates and earth dams, therefore there is too much loss in the course of transporting water. The rate of utilization of the amount of drawn water is only 40 to 50 percent in general. Therefore, increasing the engineering quality of the complete canal system and strictly controlling the amount of drawing of water will prevent salinization and can also increase the rate of utilization of the water drawn. This assures increases in the yield of food grains and also reduces the cost of production. At present, according to statistics, irrigated plots under 2 mu in the irrigated land constitute 23 percent, irrigated plots from 2 to 5 mu constitute 49 percent and plots over 5 mu constitute 28 percent. The land is not even and uniform, large plots are level but small plots are not and the difference within a plot may reach 20 to 50 centimeters. Basic farmland construction centered around leveling of land must be carried out in a big way. Plots must be made smaller (1 mu is most suitable), shallow irrigation and rapid rotation must be implemented to stimulate even distribution of the salt content to benefit the growth of crops and to catch the seedling period. For example, the Hangjinghou Banner's Heping Brigade rebuilt the canal system, leveled the land, made the plots smaller, used water scientifically, irrigated rationally, and for over 10 years, the average amount of water used per mu was less than the average of the entire irrigated area by 102 cubic meters. The underground water level was lowered and salinization and alkalization of the soil were prevented and the yield was increased. In 1973, food grain production reached the "guideline," the average per mu yield was 410 jin, an increase of over threefold.

In the construction of commercial food grain base in the Houtao Plain, there are some other problems such as unrefined planting, shortage of fertilizers and shortage of labor which must be conscientiously solved by measures of scientific planting, strengthening production of fertilizers, and hastening the progress of

agricultural mechanization so that the region can develop its function as a commercial food grain base better and faster.

(5) Ningxia Irrigated Region

This region is situated in the central part of the Ningxia Hui Autonomous Region, including the 2 cities of Yinchuan and Shizuishan, and the Yinnan region (except the 2 counties of Yanchi and Tongxin), totaling 11 counties, cities and 15 regional state run farms. The total area is 27,000 square kilometers, the present area of cultivated land is 3.46 million mu, the agricultural population is 1.19 million.

This region is located on the two banks of the alluvial plain of the Yellow River, the topography is flat, the soil layer is deep, there are many canals and ditches, fertile land extends for a thousand miles, there are no droughts and waterlogging, and it is known as the "lush southern type fields north of the Great Wall." The history of reclamation here is long. As early as over 2,000 years ago, during the Qin and Han dynasties, ditches were dug and fields were created, water was drawn for irrigation, and after long periods of management, deserts were changed to "oases." It is one of our nation's oldest irrigated regions.

This region's level of production of food grains is relatively high and the region is an important food grain base of the autonomous region. For years it has been the "food grain storage" of our nation's northwest. The area of cultivated land of the entire region constitutes only 25 percent of the total of the autonomous region. The yield of food grains has in past years constituted over half of the total yield of food grains of the autonomous region. The average per mu yield of food grains of the whole region has already reached the "guideline," and there are five counties that have surpassed the level of the "Yellow River" and one county that has surpassed the level of the "Changjiang" in yields. Communes and brigades producing 1,000 jin continue to emerge. The per capita agricultural population of the entire region has an average of 1,000 jin of food grains. The amount of commercial grains provided in ordinary years constitutes over 90 percent of the total amount of commercial grains of the autonomous region. The commodity percentage of food grains generally can reach above 20 percent.

Wheat and rice are the main food grain crops of this region. Wheat constitutes 39 percent of the sowing area of food grain crops and the yield is stable. Paddy rice constitutes about 20 percent, mainly concentrated in the Yinnan region. At present, it is rarely planted in the Yinbei region because drainage is not smooth and the soil is salinized and alkalized. Other food grain crops include cereal grain, millet, sorghum, soybean, corn.

The frostless period of this region is 140 to 160 days. Multiple planting is possible, the average multiple planting index is 128 percent. The multiple planting index in the south is higher. The planting system is mostly triple cropping in 2 years. In recent years in the central part, the development of double cropping a year has been fast. In the north, one cropping a year is dominant.

This region's water conservancy conditions are good. Eighty-eight percent of the irrigated land of the autonomous region is concentrated in this region. Each person has an average of 2.4 mu of irrigated land. From 1950 to 1972, the annual average increase in the per mu yield of food grains is only 5.12 percent, slightly higher than the national average. But the yield of food grains is stable but not high, regional development is also very imbalanced. There are still 1.2 million mu of low yielding fields and nearly 3 million mu of wasteland suitable for farming. It can be seen that the potential for increased production of food grains is still great.

To hasten the construction of the commercial food grain base, the following problems should be solved.

1. Improve Saline and Alkaline Land, Change Low Yields to High Yields

The main reason that the development of food grain production of this region has not been fast is the area of saline and alkaline land is large (constituting one-third of the area of cultivated land). This type of land generally produces a per mu yield of only 100 to 200 jin, lower than the average per mu yield of this region by over one-half. These low yielding fields have affected the increase in the production of food grains of the entire region. Also, most of the wasteland suitable for farming is also low saline and alkaline land. Therefore, whether in increasing the unit area yield of the present cultivated land or developing and utilizing large areas of wasteland suitable for farming, improving saline and alkaline land is a key measure. The effective measures of this region are: basic farmland construction centered around improving soil and controlling water in a big way, implementing scientific use of water, rational drainage and irrigation, and limiting the amount of drawing of water. For example, the Taizi Brigade of the Chongxing Commune in Lingwu County carried out high standard basic farmland construction, implemented planned use of water and rational irrigation, overcame the habit of using a lot of water for flood irrigation and conserved the use of water by 12.7 percent. The underground water level dropped from the original 1.2 meters to 1.67 meters, and salinization and alkalization of soil were basically controlled. The brigade produced a per mu yield of 1,094 jin of food grains in 1973, an increase of 2.6 times in yield over that before implementation of basic farmland construction in 1964. Further increasing the drainage capability especially at the end of the irrigated region and the northern region where the slope is too gradual is an important measure to improve saline and alkaline land. Besides fully developing the gain of the present drainage facilities, organization and management should be strengthened and completion of water conservancy engineering facilities should be grasped tightly. In addition, green manure should be planted in a big way and the application of organic fertilizers should be increased, ditches should be dug for planting rice, well irrigation and well drainage should be implemented, and irrigation should replace drainage. These are all effective in improving saline and alkaline land and they can be popularized by suiting measures to local circumstances.

2. Strengthen the Production of Fertilizers, Increase the Level of Fertilization Per Mu

At present, an average per mu of 50 jin of chemical fertilizers and 25 carts of mud fertilizer (about 600 jin per cart) are applied in this region, but the quality of mud fertilizer is poor, 80 percent is loess, so-called "moving loess." There are few "sanitary fields" of unfertilized plantings. A low level of fertilization is one of the major reasons this region's yield of food grains is not high. In the future, production of fertilizers must be strengthened to increase the level of fertilization. The major ways are: to raise hogs to accumulate manure, to actively develop green manure and to popularize high temperature production of compost. This region is populated by the Chinese and the Hui national minority, and in the past, hog raising has not been developed (in 1972, there was one head of hog per 4 mu of cultivated land). In the future, hog raising should be advocated in a big way in the Chinese villages. Green manure has always been the major source of fertilizer in the irrigated region. Spring sowing of green manure or planting of winter green manure or expanding the planting of green manure by interplanting, companion planting and mixed planting in rice fields can be carried out. In the northern region, it is customary to dry the land after harvesting wheat. According to advanced experience, dryland green manure can be developed. Practice proves that multiple planting of green manure following wheat can produce increased yields over drying of land. High temperature compost is a comprehensive fertilizer with a more complete nutritional content. Its raw material can be obtained locally to change waste into something useful. Producing compost is convenient. It conserves labor. Compost can be produced throughout the year and it produces visible increases in yield. This region has rich coal resources and resources of phosphorus ore. These provide a material foundation for the development of the small sized chemical fertilizer industry in this region. In addition, grasping barnyard manure tightly, collecting sheep dung, organizing city manure to be sent into the countryside and manufacturing of "5406" bacterial fertilizer and "920" plant hormone are all important contents of building the production of fertilizers.

3. Suit Measures to Local Circumstances, Improve the Cropping System

Viewing the natural conditions, this region can realize double cropping a year. As socioeconomic conditions and conditions of agricultural production change and the level of scientific planting is elevated, continued increase of the multiple planting index is the important path to increase the yield of food grains. In recent years, in the double cropping a year experiment of rice and wheat, the high yield of 1,100 to 1,500 jin per mu has been obtained. Thus, the potential of increasing yield by changing the cropping system is great. Improving the cropping system must involve suiting measures to local circumstances. The foundation of agricultural production in the Yinnan region is good. The water, fertilizer and soil conditions are superior. Labor is sufficient. The yield is high mainly because triple cropping in 2 years was changed to five croppings in 3 years. At present, the double cropping a year experiment and the high yield models are basically all here. In counties, communes and brigades where the fertilizer and soil conditions are good, double cropping a year of rice and wheat

can be gradually test planted. The Yinbei region has poorer water, fertilizer and soil conditions. There is more land but less labor force and the area of low yielding fields is large. At present, the yield of one cropping a year is still not high enough. In the future, reform of the cropping system must be based on the foundation of increasing the production of one cropping a year to create conditions for a transition to triple cropping in 2 years or five croppings in 3 years. Individual communes and brigades with good fertilizer and soil conditions and with sufficient labor can also carry out double cropping a year experiments.

4. Grasp Well the Construction of State Run Farms, Reclaim Wasteland Resources Suitable for Farming According to Plan

This region now has 15 state run farms, constituting one-tenth of the cultivated land of the entire irrigated region. These state run farms produce only 6.5 percent of the annual yield of food grains of the entire irrigated region but provide 11 percent of commercial grains. At present, the unit yield of food grains of the state run farms is only over 300 jin. There are still 900,000 mu of wasteland suitable for farming inside the farms. These can be further reclaimed. Therefore, in efforts to increase the unit yield of cultivated land and to expand planting, the potential of the state run farms is very great. Managing well the state run farms is an important aspect in the construction of the commercial food grain base in the irrigated region.

To hasten construction of the commercial food grain base, the productive conditions must be changed with all efforts and the unit yield must be increased, and at the same time, reclamation of wasteland must be done according to plan, high yields and abundant harvests must be combined with more planting and more harvests to promote large scale increases in production of food grains. According to surveys, there are still 2.885 million mu of wasteland suitable for farming in this irrigated region. The area is one of the areas with a greater potential for expanded cultivation among the major commercial food grain bases of the nation. Large expanses of wasteland, each one being larger than 5,000 mu, altogether total 710,000 mu. In the future, the scattered wasteland can be separately cultivated by nearby communes and brigades, and large expanses of wasteland can be uniformly planned by the autonomous region to establish mechanized state run farms and to develop the land according to plan and step by step.

(6) Hexi Corridor

This region includes the 16 counties in the 3 regions of Wuwei, Zhangye, Jiuquan and Jiayuguan City north of Qilianshan and west of the Yellow River in Gansu Province. The agricultural population and the area of cultivated land constitute 17.9 and 17.4 percent of the totals of the province respectively. Each person has an average of 3.5 mu of cultivated land. This is one of the areas in Gansu with more land and less people. The history of agricultural reclamation here is long. As early as the Han Dynasty, a prefecture and county had been established, and reclamation by soldiers was practiced. Agriculture on fertile oases was developed. The geographical position and strategic position

were very important. But before Liberation, the level of production was very low. Food grain production was low and unstable. In 1950, the average per mu yield of food grains was only 150 jin, total yield was 710 million jin. After Liberation, food grain production developed rapidly year after year. In 1974, average per mu yield of food grains increased 1.28 times over that of 1950 and total yield increased 2.6 times, reaching 2.58 billion jin. Each person had an average of 963 jin of social food grains [4752 7380 4357 2585], higher than the provincial average by 47.9 percent. In the same year, the amount of commercial food grains shipped to the outside constituted 42.8 percent of the commercial food grains of the entire province, forming Gansu Province's most important cotton and food grain producing region. The yields of food grain and cotton constituted one-third and one-half of the total of the entire province respectively.

The Hexi region is situated deep in the inland. Rainfall is rare and the climate is arid. Cultivated land is interwoven in the desert, gobi and grass oases. Water determines the fields. The agricultural and farming region is limited to below 2,500 meters above sea level. The main fertile farming areas of oases are concentrated within 1,000 to 1,600 meters in elevation. According to landform and hydrological conditions, the cultivated land in the region can be generally divided into three types: One is the fertile oases at the lower part of the central alluvial fan of the Corridor. The topography is flat, the soil layer is deep, the soil texture is fine, water and grass are abundant and beautiful, and this region is the essence of agricultural production of this region. The second is the upper part of the alluvial fan. The slope is steep. Underground water is buried deeply and generally there is no threat of salinization. Irrigation depends on water from mountain torrents. But the amount of water is not uniform and the arrival of water may be late or early, and water used by crops is not assured. The proportion of tempered fields is high. The third is the upper reaches of the valleys between mountains. Irrigation is convenient, but the soil layer is thin, the elevation is high and the weather is cold, unfavorable to multiple planting and growth of thermophilous crops. The cultivated land of the fertile oases becomes expanses east of Wuwei. To the west of Wuwei, especially west of Jiayuguan, it is scattered. The index of reclamation of the entire region is only 2.5 percent, but it is lower to the west. Large areas of stationary, semi-stationary or mobile sand dunes are distributed widely in the plains. They cause severe damage to agricultural production and should be controlled and reformed. Large expanses of plains of saline soil are frequently distributed in the lower reaches of rivers and around lakes and inland seas. They are the grazing fields at present, and after improvement, they can be further reclaimed.

The annual rainfall in this region is only 40 to 160 millimeters. This drops from east to west. The annual amount of evaporation is 1,500 to 2,000 millimeters, increasing from east to west. The crops depend entirely on irrigation, "without water, there is no agriculture." Except for the Jingtai County in the east, the whole area belongs to the valleys of inland rivers. There are three river systems of the Shiyang River, Heihe, and Shule River. The annual runoff of surface water is 7.3 billion cubic meters. The runoff of spring water is 5.4 billion cubic meters. The dynamic reserve of underground water is 5.7 billion meters. At present, they are not fully developed and utilized, and they

are not rationally utilized. The heat conditions of this region are rich. The cumulative temperatures ≥ 10°C is 3,000°C to 3,600°C. The frostless period is 160 to 200 days. The greatest amount of heat is in Dunhuang, Anxi, Jinta, and cotton can be planted and multiple planting is possible. Sunshine is sufficient. The annual average amount of sunshine is 3,000 to 3,300 hours. The percentage of sunshine is 70 percent. The total amount of radiation per year is 150 kilocalories per square centimeter, higher than other regions at the same latitude. At the same time, the day and night temperature difference can reach 15°C, beneficial to assimilation of crops and accumulation of starch and sugar. The wasteland resources suitable for farming in this region are rich. According to surveys, there are over 6 million mu of land which have better water and soil conditions and which can be easily reclaimed. In addition, there is also a definite area of land left to waste and resting fields between rotations in the present area of cultivated land. Especially in the mountain regions where there are few people and more land and the lower reaches of the irrigated region where the conditions of water sources are poor, the area of resting land between rotations and uncultivated land can constitute about 30 percent of the area of cultivated land. There are also a fair proportion of low yielding soils which need to be reformed in the present area of cultivated land. According to past surveys, saline and alkaline cultivated land covers 1.5 million mu.

According to the above, it can be seen that the potential for developing agriculture in this region is great. In the future, the following work must be done well to make this region into a national commercial food grain base.

[pp 164-180] [Text]

1. Combine the Increase of the Unit Yield and Expansion of the Area of Cultivation

This region can expand the cultivated land and increase the unit yield in a big way. Analysis of the present conditions shows increasing the unit yield should be the main pursuit because: 1) The unit yield of the present cultivated land is low and the proportion of low yielding areas is large. After definite efforts, faster increases in yield can be realized. Increasing the yield requires less land, labor and capital than reclamation; 2) At present, the area of cultivated land worked by each laborer is rather large (10 mu), and efforts should be concentrated to increase the level of intensive cultivation, especially to change the situation of resting land in rotation and leaving the land to waste; 3) The presently available wasteland suitable for farming is generally superior natural grazing fields. Too much reclamation will bring about conflicts between agriculture and animal husbandry. Reclamation and cultivation of slopeland will cause a loss of water and soil and the fertility of the soil will drop. The gain is not worth the loss. Viewing the present foundation of water conservancy in this region and the possibility of expanding the irrigated area in the near future, expansion of cultivation should not be rushed; 4) Advocating interplanting and companion planting and implementing strip planting can expand the planting area and increase the unit yield at the same time on the same piece of land.

Of course, greatly increasing the unit yield does not totally exclude expansion of the area of cultivation. Viewing the entire region, the regional distribution of water and soil resources and their combination are very imbalanced. The Shule River Valley has more land and lacks water. There is 4.5 million mu of wasteland which has good conditions and is suitable for farming but the water source is only 1.9 billion cubic meters. After fully utilizing the water source, only over 1 million mu can be reclaimed. The Heihe valley has a rich water source, about 6.5 billion cubic meters. The conditions of the soil are good and there is also a lot of wasteland suitable for farming. But most of the wasteland areas lack water. The land is high and reclamation is possible only after completion of large engineering projects to draw and store water. The Shiyang River Valley has less water and less land and the potential for reclamation is not great. At present, Wufoshi in Jingtai County in the east uses water carried four levels from the Yellow River. This has created conditions for expanding the irrigated area in Gulang and Jingtai counties. It must be pointed out that to prevent disregard of the conditions and blind and reckless reclamation, appropriate reclamation is possible only after the water conservancy conditions have been improved. The method of establishing satellite villages realized by Jingtaichuan can be popularized. Production teams with more people and less land can be divided according to plan and moved to the wasteland areas to reclaim land and establish satellite villages. Accounting and rationing are uniformly handled by the original production team and gradually the satellite villages can become independent in production and accounting.

2. Open Up Sources and Control Flow, Fully and Rationally Utilize Water Resources Further

Water conservancy is the lifeline of developing production in Hexi. After Liberation, the irrigated area of this region has developed to 8 million mu, and of this, 6 million mu can be assured of irrigation, constituting 60 percent of the cultivated land. But utilization of water resources is not rational enough mainly because: 1) Water from the rivers has not been controlled and regulated. Water is deficient in spring and summer and water flows away uselessly in autumn and winter (each year during the period when water is not used, the loss of flood water constitutes about 30 percent of the surface water). 2) The canal system is confusing and leakage is serious. The utilization coefficient of the canal system is only 30 to 40 percent. 3) The soil is not level, field construction projects are not complete, the method and the system of irrigation are not rational, and the quota for irrigation is too large. The average per mu quota is above 500 cubic meters (the highest gross quota for irrigation can reach 1,800 cubic meters) but actual needs do not surpass 400 cubic meters. (For example, wheat generally needs 250 to 330 cubic meters.) The waste of water sources is large. At some places, the soil has become swampy, salinized and alkalized or hardpan. In addition, the development and utilization of underground water is not sufficient. In the entire region in 1973, there were over 13,000 mechanized wells, but they only irrigated 19 percent of cultivated land.

In face of these main problems, the following measures should be taken: 1) Suit measures to local circumstances to build reservoirs, rationally regulate river water to solve the imbalance of water used for irrigation between seasons and years. According to surveys, if reservoirs can be built above the mountain outlets of the various rivers, 7 billion cubic meters of water can be used to irrigate 10 million mu. 2) Strengthen lining and add a leakage prevention layer to increase the utilization coefficient of the canals to 60 to 70 percent. 3) Improve and rebuild lateral canals and farmland canals, complete the canal system in the fields, level and prepare the land in a big way, deeply upturn and improve the soil, improve the method and system of irrigation, increase the efficiency of irrigation, and reduce the amount of consumption of water for unit yield of agricultural crops. 4) Develop irrigation in regions at the lower reaches of rivers where underground water is rich, reduce the pressure of mountain water, lower the underground water level, and reduce loss by evaporation. These benefit the prevention of salinization of soil and improve saline and alkaline soils.

3. Develop Green Manure, Improve Fertility of the Soil, Assure Continued Increases in Production of Food Grains

The organic content of the soil of this region is very low. The soil is hardpan and ossified. At present, the main methods are application of farmhouse manure and rotational resting of the land to supplement the nitrogen consumed by the crops. The soil is upturned for drying or covered with sand to eliminate hardpan. Although covering the soil with sand can increase temperature and moisture of the soil, the soil texture becomes coarse, the ability of the soil to retain water and fertilizers is lowered, and the ground surface is gradually elevated. Farmhouse manure is also limited. In 1974, there was only one head of hog for every 14 mu of land on the average and this could not satisfy the demands of high yields. In recent years, the counties of Zhangye, Linze and Gaotai created the successful experience of suiting measures to local circumstances to develop green manure and increase the yield of food grains. They interplanted sweet clover or planted vicia sativa in multiple plantings in wheat fields of one cropping a year in regions where there is water, more people and less land. In general, the yield of the aftercrop increased by 30 to 40 percent and the highest could reach 60 percent. In arid mountain regions and areas along mountains where transporting fertilizers is difficult and where there is more land and less people, the area of land resting in rotation is large, generally 20 to 30 percent and reaching a high of 40 percent. Companion planting of sweet clover and "rotation of food grain crops and grass" can serve importantly to solve the problem of the "three materials" in the mountain regions, retain water and soil and increase the production of food grains. In addition, empty land in forests, wasteland and uncultivated mountains can be fully utilized to plant green manure.

4. Suit Measures to Local Circumstances, Improve the Planting System

The laboring people of Hexi have accumulated a lot of experience in interplanting, companion planting, multiple planting, rotational planting and reverse cropping in the long term struggle for production. According to incomplete statistics, there are over 20 methods of interplanting and companion planting

practiced in this region. The major ones are: 1) Changing one cropping a year to double cropping a year: including winter wheat-multiple planting (multiple transplanting) millet (or buckwheat, cereal grain), and paddy rice, wheat (or naked barley) double cropping. The key to changing one cropping to double cropping is "early," to select early maturing high yielding varieties and implement a series of techniques of cultivation for early maturation and bumper harvests. 2) Popularize strip planting in regions where there is less land and more people mainly by rationally dense planting, developing superiority of side rows and fully utilizing light, heat, water and soil. The key to increasing yield is rational combination of different crops, such as summer crops coupled with autumn crops, tall stemmed coupled with short stemmed, straight roots coupled with fibrous roots, ombrophilous crops coupled with heliophilous crops, crops that exhaust soil fertility a lot coupled with crops that exhaust soil fertility only a little. Specifically, in the river regions, there are mainly: wheat with corn, bean (pea, broad bean) with corn, potato with corn, linseed with corn, and wheat with cotton. In the arid regions, there are mainly: wheat with potato, and potato with broad beans. In the suburbs of cities and towns, there is also wheat with vegetables. By strip planting, the yields of ordinary wheat varieties can increase by 30 percent, and the yields of corn, potato and broad beans and such intertilled crops can increase by 50 percent.

5. Adjust Distribution of Crops, Expand High Yielding Crops

At present, the types of crops in this region are relatively simple. At some places, wheat constitutes over 50 percent of the total sowing area and over 90 percent of the area of summer fields. The years of continuous plantings are long, diseases and insects are rampant, fertility of the soil has dropped, affecting increases in yield. There are also some regions where the area is too large in autumn and too small in summer, the area of millet is too large, rotational planting and reverse cropping are not balanced, and the yields are low and unstable. If the area of spring wheat and millet can be appropriately suppressed, and corn, potato, broad bean and winter wheat can be expanded, then this will benefit the adjustment of the arrangement of the labor force and the seasons, and lessen the conflict between the use of water among crops, reduce weeds and insect pests, and provide some grass for feed and fodder. At the same time, potato and broad beans are good crops for the crop opening of wheat and are beneficial to increasing yield. According to the experience of advanced models of the mountain and arid regions, by appropriately decreasing the area of wheat, potato and broad beans together can constitute one-third of the planting area. In the river regions where the conditions of water and fertilizers are good, the planting area of corn, broad beans and winter wheat can be rationally expanded (according to surveys, the unit yield of winter wheat is generally higher than spring wheat by 20 to 30 percent, corn is higher than spring wheat by 30 to 50 percent). Developing winter wheat can also avoid or reduce the damage by dry hot winds in summer. Because winter wheat can be harvested earlier than spring wheat by 10 days, this also creates conditions for changing one cropping to two croppings.

6. Build Forest Belts To Prevent and Control Damage by Wind and Sand

This region is rather seriously damaged by wind and sand in spring of each year. Every year, several tens of thousands of mu of farmland are damaged, affecting the yield of food grains and cotton. Greatly building protective forest belts can defend against big winds, dry hot winds, wind and sand and wind erosion of soil, and can improve microclimatic conditions in the farmland. The disposition of the forest belts and grouping of types of trees must be based on the principles to "suit measures to local circumstances," "set up defenses against specific damage" and "suit appropriate trees to the locality." Building of protective forests for farmland and basic farmland construction of building canals and strip fields and roads should be combined under one unified plan. The types of trees that can grow rapidly, that have a long life, that have a high economic value, and that are needed by the masses in their productive life should be selected and planted, mainly white poplar, arrow poplar, Cathy poplar and elm, appropriately grouped with oleaster, mulberry and fruit trees.

(7) Guanzhong Plain

This region is situated in the central part of Shaanxi Profince, including the 2 regions of Xianyang and Weinan and the cities of Xian, Baoji, Tongchuan, totaling 43 counties and cities. The total area is 52,977 square kilometers. The cultivated land covers 31.069 million mu, which includes 32.5 percent river land, 43.7 percent highland and 23.8 percent mountain land. The farming population is 9,461,200. Per capita farming population averages over 3 mu of cultivated land.

The topography of Guanzhong is high in the north and south and low in the middle. The west is high and the east is low, and the plain broadens from west to east along the Wei River. The soil of the highland and the mountain land originated from loess mother soil, mostly stratified old manural loessial soil, yellow cultivated loessial soil and loessial soil. The river region is mostly silt and eutrophic soil. Generally the soil layer is deep and thick and the soil is fertile. The history of farming and reclamation in the Guanzhong region is long. Since the Qin and Han dynasties, canals have been dug to draw water for irrigation and develop agriculture, and the region is one of our nation's oldest irrigated regions. At present, it is the primary agricultural base in Shaanxi Province. The yields of food grains, cotton and oil constitute 60, 95 and 40 percent of the totals of the province respectively. It is also an important national food grain and cotton base. In 1971, Guanzhong provided 71.5 percent of the total amount of commercial grains of the province, and the commodity percentage reached 17 percent. In 1975, 51 percent of the counties and cities produced yields reaching the "guideline."

Production of food grains of this region is mainly summer grains (constituting 57.2 percent of the total yield of food grains). Wheat is the most important among them (constituting 86.7 percent of the yield of summer grains). Corn is the major autumn grain (constituting over half of the yield of autumn grains). The multiple planting index of cultivated land of food grain crops is 141 percent. In the river regions, double cropping a year of winter wheat-corn is the

main planting system. The foundation for production is good and the intensity is high. In the arid highlands, triple cropping in 2 years is the main system. Double cropping a year is also practiced at a few places where water and fertilizer conditions are good. But one cropping a year still constitutes one-fourth. In the northern mountain regions, one cropping a year of spring corn is basically practiced because of the high elevation and low temperatures.

Since Liberation, as water conservancy construction develops, food grain production has gradually risen year by year. But because climatically, damage by spring and summer drought is still serious, the production of food grains is still not stable enough. Variation in a year may reach over 10 percent. Stability is worse in the arid highlands north of the Wei River where the elevation is higher.

Accordingly, the major measures for future development of production in this region involve further implementation of basic farmland construction, increasing the ability to resist natural disasters to create conditions for stable yields, correspondingly changing the planting system and grasping well-balanced production in the arid highland regions north of the Wei River.

1. Basic Farmland Construction Centered Around Water Conservancy

The major problem in the construction of the Guanzhong commercial food grain base is drought. In 1971, cultivated land with irrigation facilities constituted only 41 percent. The area assured of harvests in drought and waterlogged conditions constituted only 17.8 percent of the area of cultivated land. The conditions of irrigation in the arid highlands north of the Wei River is worse. A shortage of water sources is the major factor causing drought.

To thoroughly solve this problem, building of the Longmen Reservoir at Yumenkou in the middle reaches of the Yellow River can be considered. Before building this large scale project, the irrigation projects to draw water from the Yellow River at the three places of Tongguan, Hancheng and Heyang (such as the Donglei Yellow River Water Pumping Station in Heyang County has a designed area of irrigation of nearly 1 million mu) and the project to transfer southern water of the Nanshan tributary of the Wei River to the north must be grasped well to thoroughly solve the problem of the shortage of water sources in the arid highlands and river regions north of the Wei River. Underground water can te actively developed in the river regions where the quality of water is good, where underground water resources are rich and where underground water is shallow (generally 10 to 40 meters), and double irrigation by wells and canals can be implemented. At present, most of the cultivated land in this region is characterized by large flat expanses and uneven small expanses. The gain of irrigation facilities cannot be fully developed. Therefore leveling the land and improving the soil must be done well.

2. Suit Measures to Local Circumstances, Create Conditions, Improve the Planting System

In the central river regions, double cropping a year of winter wheat-corn is practiced in general at present. Because the crop openings of the two crops

are relatively late, timely maturation of corn and leveling and deep upturning of the land are affected. Wheat frequently cannot be sown on time, sometimes "autumn chasing summer and summer chasing autumn" occurs, and to a definite degree, increases in the yield of food grains are affected. In recent years, companion planting of corn in wheat fields has been practiced, and late corn has been changed to early corn, thus assuring the timely maturation of corn and the timely sowing of wheat. The two late crops were changed to two early crops. Manual labor and animal labor were adjusted and the seasonal conflicts were solved. The results of increased yields were more outstanding.

In the river regions where water and fertilizer conditions are better and in the regions of the northern foothills of Qinling south of Wei River, double cropping a year of continuous rice and wheat can be practiced. The per mu yield of the advanced models reached 1,730 jin. This can be gradually popularized by creating conditions and suiting measures to local circumstances. At places where labor is abundant, seedling cultivation and transplanting can be done in a big way to change the one cropping a year of raw cotton fields to double cropping a year of cotton and oil bearing crops or cotton and food grain crops. The growth season can be fully utilized and the multiple planting index can be increased. The effect of increasing production is more outstanding than interplanting and companion planting.

As the conditions of water and fertilizer continue to improve in the arid highlands north of the Wei River, autumn food grains can be appropriately expanded by suiting measures to local circumstances. At places where water and fertilizer conditions are better, corn can be used as the main crop and millet and cereal grains can be appropriately planted. At places where water and fertilizer conditions are poor, millet and cereal grains should be used as the main crop and corn should not be planted too much.

3. Grasp Construction of the Arid Highland North of the Wei River Well

This is the key to construction of the Guanzhong food grain base. The area of the highlands of the arid highlands north of the Wei River is expansive. The topography is flat. The soil layer is deep and thick. There is more cultivated land (constituting over 40 percent of the cultivated land of the entire Guanzhong region). There is more land and less people. Per capita agricultural population averages 4 mu of cultivated land. At some places, this can reach as high as 10 to 20 mu. Therefore, although unit yield of food grains is low (only 200 jin), the amount of commercial food grains provided is large (Pucheng County alone provides about 100 million jin of food grains a year). For many years, production practices have fully proven that bumper and poor harvests of the Guanzhong commercial food grain base are determined to a large degree by the harvests of food grains of the arid highlands north of the Wei River. If food grain production here is increased, the production of food grains of the entire Guanzhong region will increase.

Construction of the arid highlands north of the Wei River in the distant future involves first grasping well the planting of trees, forestation and planting of grass, treating the surface of the highlands, planting trees and grass along

ravines, preserving the highlands and firmly establishing the canals, preserving water and soil, conserving water sources and regulating climate. The second is to build water conservancy projects in a big way, to build projects to draw water from the Yellow River according to plan, to lift water up to the highlands and solve the problem of the shortage of water sources. At the same time, projects to store water must be grasped well. Favorable landforms must be selected to build ponds and reservoirs to "store water in autumn and winter and to resist drought in spring and summer." Storing, drawing and carrying water must be combined together to fully develop the gain from irrigation by water conservancy facilities. The land must be leveled and the soil must be deeply upturned and improved. Level banks between fields must be built and Dazai fields must be built. The third is to produce fertilizers in a big way. Shortage of fertilizers is also one of the major problems in agricultural production in the arid highlands north of the Wei River. Accumulation, manufacture, raising and planting of fertilizers must be done on the one hand and they must be combined with using and nurturing the land on the other hand. The distribution of crops must be rationally adjusted. Taking summer fields, wheat and wheat planted on summer fallow land as the key links as stipulated in the policy of "the three main links" should be insisted upon. Planting of peas, green manure and rape as the forecrop of wheat must be insisted upon. These are beneficial to storing of water and preserving moisture in the soil, improving soil structure, and they are also beneficial to banking fertilizers and fertility of the soil and increasing the yield of wheat.

4. Hasten Construction of New Commercial Food Grain Bases

The new national commercial food grain bases are mainly the Heilonggang Plain in Hubei and the Huibei Plain in Jiangsu and Anhui provinces. They all had a shortage of food grains and they were all low yielding regions with large areas of saline and alkaline land and they frequently suffered from drought and waterlogging. During the past 20 years, as major large scale engineering projects to control the Yellow, Hui and Hai rivers were completed, leveling and preparation of land to realize garden farming of mass character were carried out in a big way. The ability to prevent floods and drain waterlogged conditions was increased. The area of saline and alkaline land reduced. The production of food grains increased rapidly. Thus, this region has started to become a self-sufficient region. At present, this type of base does not occupy an important position among the 15 national commercial food grain bases. The agricultural population constitutes 28 percent, the area of cultivated land of food grain crops and the sowing area of food grain crops all constitute about 25 percent. The yield of food grains constitutes 17.5 percent, commercial food grains constitute only 6.8 percent. But the population in this type of bases is dense. They have a definite foundation in agricultural production. After the productive conditions are further improved, food grain production will develop more rapidly, and they will gradually serve as commercial food grain bases.

At present, the per mu yield of this type of bases is only over 300 jin, equivalent to only 70 percent of the national level. The average multiple planting index is only 149 percent. Basically, there are triple croppings in 2 years. But based on the conditions of heat, the active cumulative temperature

is about 4,500°C. The frostless period is 180 to 220 days. It is entirely possible to increase multiple planting to double cropping a year and to increase the per mu yield to reach the "guideline." The key is to grasp well the following measures: 1) further perfect farmland water conservancy facilities, thoroughly solve the problem of drought and waterlogging, and on this basis, adjust the distribution of crops; 2) increase the level of application of fertilizers, advocate intensive cultivation, improve low yielding fields, and increase unit yield of food grains by many methods.

(1) Huibei Plain

The Huibei region in Jiangsu and Anhui provinces includes Xuzhou, Huiying in northern Jiangsu and Suxian and Fuyang in northern Anhui, totaling 4 regions, 41 counties and cities. Historically they suffered from floods, waterlogging, drought and alkaline damage for a long period. There were many disasters and the yield was low. There was a shortage of food grains. After Liberation, the people of Huibei launched large scale basic farmland construction. At present, floods have been basically controlled. Damage by waterlogging has been greatly reduced. Up to 1971, the irrigated area of the entire region has expanded to 17.37 million mu. Improvement of soil and control of alkalinity covered 3.51 million mu. The area of machine planting was expanded to 14.42 million mu. High and stable yielding farmland that was assured of producing harvests in drought and waterlogged conditions covered 13.97 million mu. Reform of agricultural techniques and the planting system was carried out. In particular, "changing dryland fields to paddy fields" was implemented over large areas, and the situation of low yields and many disasters was rapidly changed. In 1973, the region had nine counties that produced per mu yields of food grains that met the "guideline." In the same year, the entire region provided one-third of the total amount of commercial food grains of the two provinces of Jiangsu and Anhui to the nation. It is a concentrated food grain producing region and also an important region of cotton, oil and hog production. The cultivated land here is expansive, the population is dense, the potential is great, and the region is a new commercial food grain base that has a very broad future for development.

But at present, the level of food grain production of this region is still very low. In particular, regional development is imbalanced. In general, the Xu-Hui region in the east is higher than the Su-Fu region in the west. The region irrigated by well water is higher than the region irrigated by river water. Regions that have changed to planting rice are higher than dryland crop regions. Generally, hilly slopeland and lowlands of rivers and lakes produce unstable and low yields. The proportion of low yielding areas is large but the potential for increased yield is great.

The major problem at present is that drought and waterlogging are still serious. "Spring drought, summer waterlogging, autumn drought" seriously threaten agricultural production. During the 23 years from 1949 to 1972, there were 8 years in which the area of flooding and waterlogging covered over 10 million mu. There were 10 years in which waterlogging preceded drought or drought preceded waterlogging. Because of historical reasons, damage by drought and waterlogging at present has still not been eliminated. Second, the present fertilizer conditions cannot adapt to the demands of high yields. In general, the level of

fertilization is low, the area of low yielding fields is large, and the increase in production of food grains is seriously affected.

To build this new commercial food grain base well, the productive conditions must be further changed to overcome unfavorable natural factors. Production of fertilizers, banking fertilizers and improving the soil, rational improvement of the planting system and increasing multiple planting must be grasped well to fully utilize water and soil resources and achieve the goal of producing stable and high yields.

1. Grasp Water Conservancy Construction Well, Eliminate Damage by Floods and Waterlogging, Develop Irrigation

The problem of flooding and waterlogging in regions along rivers and lakes and in lowlands has not been completely eliminated. The problem of irrigation of dryland also has to be further solved. Besides continuing to fortify and increase the ability to prevent floods, dredging of major rivers and tributaries should be strengthened, main rivers and ditches should be dug when necessary to elevate the standard of draining waterlogged conditions. In regions along rivers and in lake regions and lowland waterlogged regions, efforts should be combined with the change to rice, dikes and floodgates should be built, electrical and mechanical drainage and irrigation should be developed. In the plains, work involving ditches, canals, roads and forests should be combined. Drains and ditches in rectangular fields and the five ditches must be built as a system to meet the demands of irrigation and realize drainage and lowering of the underground water level. In hilly mountain regions, comprehensive management of mountains, water, forests and fields should be combined with construction of reservoirs to store water and to connect ditches, ponds, reservoirs and canals to realize the ability to store, draw, carry and transfer water. In places where surface water sources are lacking but there are rich underground water resources, such as Feng, Pei, Su, Dang counties, emphasis should be placed on developing well irrigation. Irrigation of dryland crops should be developed in a big way. At present, the irrigated area throughout the whole region constitutes only 30 percent of the area of cultivated land. Irrigation of dryland food grain crops can generally increase the yield by 20 to 50 percent, and even in multiples. Therefore, completion of the presently available water conservancy projects as a system must be intensified to fully develop their function and gain and expand the area of irrigation.

2. Open Up Wide Sources of Fertilizers, Nurture Fertility of the Land, Improve Low Yielding Fields

The number of domesticated animals raised in this region is small because of the large area of cultivation. In 1971, there were only 1.3 head of hogs per 10 mu of land on the average. Although planting of green manure has developed, the area constitutes only 11.9 percent of the area of cultivated land. At the same time, because of a shortage of fuel, most of the stalks are not returned to the fields. The amount of chemical fertilizers used per mu is only 19 jin. In recent years, as the areas of "conversion of dryland to paddy fields," multiple planting, interplanting, companion planting and mixed planting expand,

the problem of fertilizers has become very outstanding. In ordinary years, there are about 10 to 15 percent of food grain crop fields that are not fertilized. In the future, besides active development of hog production to expand the sources of farmhouse manure, emphasis should be placed on expanding the planting of green manure. Green manure can be planted singly or interplanted and companion planted in fields of early rice and winter fallow land, wheat crop openings and miscellaneous spring crops (in winter, vetch, astragalus and vicia sativa should be the main crops, in summer the green manure is mainly sesbania and mung bean). Winter fallow fields can also be fully utilized (the present winter fallow land constitutes about 40 percent of the area of cultivated land) to develop winter rape and natural water surfaces can be used to develop "three aquatic plants and one duckweed." Planting of protective forests for farmland, forestation and greening of plains should be carried out in a big way. The problem of fuel in farm villages should be appropriately solved. Stalks should be returned to the fields or used to raise domesticated animals so that livestock production can stimulate agriculture. In addition, popularizing liquid manure pits, changing dry fertilizers to liquid fertilizers, gathering green manure, digging ditches and making grass mud rotted manure are all effective measures to expand the source of fertilizers.

The areas of low yielding soils in this region are still relatively large and they are the key tasks of reform. They include alkali granite soil, shajiang soil, lacustrine black soil and sand, covering over one-third of the cultivated area. The structure of these low yielding soils is poor, fertility is low, they easily become dry and waterlogged, and the per mu yield of food grains is generally only 100 to 200 jin. Improvement of the soil must suit measures to local circumstances and must combine the implementation of agricultural measures, water conservancy measures and mechanical measures. In the plains, efforts must be combined with water conservancy construction to upturn the soil and level the land to realize garden farming. In regions of alkali granite soil and sandy regions of the abandoned section of the Yellow river, the main measure is to silt and compress the sand, to unblock drainage channels, lower the underground water level, plant green manure in rotation, plant trees and forests and strengthen planting management, develop comprehensive control of water, fertilizers, soil, forestry and management. In lowlands which are easily waterlogged and regions of saline and alkaline soils and silt where the water sources are abundant, dryland fields should be changed to paddy fields to practice rotational planting of rice, wheat and green manure.

3. Increase Unit Yield of Late Wheat Crop, Firmly Establish Conversion of Dryland to Paddy Fields, Suit Measures to Local Circumstances To Implement the Double Cropping System

In 1971, dryland food grains of the entire region constituted 79 percent of the sowing area of food grain crops and beans. The average unit yield was only 207 jin. In particular, the unit yield of wheat was very low, only 137 jin, lower than the average unit yield of food grain crops by 60 percent. The reasons are that conditions of water, fertilizer and management could not catch up, and more importantly, in recent years, dryland has been changed to paddy fields and

the areas of summer sown crops of multiple plantings--sweet potato, corn, sorghum, rice following wheat have greatly expanded, the proportion of late wheat crop greatly increased (constituting 47 percent of the sowing area of wheat), thus timely sowing was not possible and the yield was affected (the yield was lower than the yield of timely sown crops by 20 to 40 percent). This became the weak link in dryland food grain crop production, and it also hindered increases in the production of food grains at many places. Therefore, future increases in food grains must be realized through increasing the unit yield of late wheat crops. Some places in the region have gained some experience in increasing the yield of the late wheat crop, mainly: seeking earliness in lateness, seize the initiative; early sowing and early germination to seize early seedlings; early management and fine management to stimulate early development; resist disasters and prevent disasters to seize high yields. Also, early, intermediate and late maturing varieties must be rationally coupled to solve the seasonal conflict between rice and wheat, and wheat and dryland crops (food grains).

In recent years, the results of increasing yields by changing dryland fields to paddy fields in the region have been very remarkable. For example, from 1969 to 1973, the area of rice grains in the Xuhui region expanded from 1.79 million mu to 6.4 million mu (in recent years, this further expanded to over 8 million mu). The average annual yield over the 4 years increased 760 million jin (72.6 percent came from rice grains). This region which had always been a region with food grain shortages has become a surplus food grain region. Again, for example, the Suqian County in the Huiqing region had always had shortages of food grains and low yields. Each person had an average of only 200 to 300 jin of social food grains [4752 7380 4357 2585]. Since 1969, dryland fields have been converted to paddy fields, and in 1973, the area of rice grains expanded from 280,000 mu to 690,000 mu, and the total yield of food grains increased from 280 million jin to 640 million jin, 86 percent of which came from rice grains. In 1973, the entire county provided 120 million jin of commercial food grains. The county which had long been a county with a shortage of food grains has become a county providing more commercial food grains and has become known as the "southern type fields in Hubei." The major experience of all advanced units that have changed to rice is to actively create water conservancy conditions in farmland and to insist upon the principle of "using water to determine rice," plant winter green manure in a big way (especially vetch), implement rotational planting of rice and green manure or rotational planting of dryland crop and paddy rice, and combine using and nurturing of land. According to the actual conditions of the Hubei Plain, with the prerequisite of an assured water source, converting dryland fields to paddy fields should first be realized in the lowlands that are easily waterlogged, regions where autumn harvest is not assured, and saline and alkaline land where dryland crops cannot easily grow. The results of increased yields from the conversion of dryland fields to paddy fields in these places are visible. Dryland crops should be the main crop in places where water sources are not abundant and where dryland crops can also produce high yields. Paddy and dryland crops can both be considered for producing double high yields of dryland and paddy crops in places where water sources are available for planting either paddy or dryland crops. Attention must be paid to separating paddy and

dryland crops so that each will have its own expanse to avoid paddy crops wrapping dryland crops and dryland crops wrapping paddy crops. The area of conversion of dryland into paddy fields in the Huibei region is relatively large. At present, emphasis is on firmly establishing the area and increasing unit yield to further develop the superior function of "conversion of dryland to paddy fields." The heat resources of this region are suitable for developing the double cropping system. At present, it is basically triple cropping a year. The potential for increasing multiple planting is great. If the multiple planting index can be increased to 180 percent, then an additional sowing area of 15 million mu can be realized. Of this, 80 percent can be used as food grain fields. Calculating at a per mu yield of 200 jin, the annual increase of food grains will reach 2.4 billion jin. Conditions should be actively created to achieve greater, faster, better and more economical results in the construction of this food grain production base.

(2) Heilonggang Plain

This region is situated in the plains of the lower reaches of the Hai River Valley in southeastern Hebei Province. Administratively it includes all of the 14 counties and 1 city of the Cangzhou region, all 11 counties of the Hengshui region, the 8 eastern counties of the Xingtai region, the 10 eastern counties of the Handan region, and the 2 southern counties of the Langfang region, totaling 46 counties and cities. The area constitutes 19 percent of the province. In 1973, the population was one-third strong that of the province's total. Before controlling the Hai River, food grain production was low and unstable. In ordinary years, the average per mu yield was less than 100 jin. Total yield of food grain production constituted only one-fifth of the province's total. The region had never been self-sufficient. From 1953 to 1973, the region consumed a total of 13.5 billion jin of food grains sold under state monopoly. The average annual shortage was 640 million jin, equivalent to 61 percent of the total shortage of the province. It was a "dragging" region of Hebei Province. But it is also a region with a great potential for increased yields. After the Hei River was brought under large scale control, the productive conditions greatly improved. The level of food grain production visibly increased. In 1973, the total production of food grains reached 7.5 billion jin, equivalent to 27 percent of the total of the province. The average per mu yield of food grains of the entire region was 294 jin. In 1974, this increased further to 300 jin. In these 2 years, the region provided a total of 100 million jin of surplus grains to the state. It has already started to change from a region with a shortage of food grains to a region that is basically self-sufficient.

The main reason of the long period of low and unstable yields in the production of food grains in this region is serious damage by drought, waterlogging and alkalinity. This is the region in the province with the most serious damage from drought and waterlogging. Between 60 and 70 percent of rainfall are concentrated in July, August and September. During every heavy rain, the flood water from the mountain regions of Taihangshan pours into the plains of this region. The river channels in the lower reaches are narrow, the topography is low and flat, and because of the many floods and changes in the waterways of the Yellow River, Hai River and their tributaries throughout history, there is a lot

of lowland sediments, and water does not flow smoothly, causing floods and damage. Good fields are submerged and the cities and traffic safety are seriously threatened. During the 15 years from 1949 to 1964, there were 9 years of floods and waterlogging. In the big flood of 1963, one-third of the cultivated land of this region was flooded. Because of the frequent damage by drought and waterlogging and improper irrigation, secondary salinization of the soil is widespread and serious. About 18 million mu of land were salinized (constituting over half of the cultivated land). This type of secondary salinized and alkalized land has a low ground temperature, the fertility is poor, seedlings cannot be assured of growth in spring and harvests cannot be assured in autumn, "spring is white all over, in summer there is water all over, seedlings are hard to come by in cultivated land, alkaline is seen but not food grains."

According to mass experience, "alkaline comes from water and alkaline leaves with water." The key of the three forms of damage by drought, waterlogging and alkaline is water. Since complete control of the Hai River began in the winter of 1963, and after over 10 years of harsh struggle, flood and waterlogging damage have been basically eliminated at present. The ground surface water and underground water have been utilized to develop irrigation in a big way. The ground surface water resources of the entire region are estimated at 7.8 billion cubic meters annually, 80 percent of which come from the flood waters of the mountain regions of the upper reaches. In the past, the water was drained, not stored, and the rate of utilization was low. In recent years, reservoirs have been expanded and newly built at the upper reaches. The ability to store flood water has reached 15 billion cubic meters. This not only has reduced the threat of flood water but has also created conditions for the full utilization of surface water sources. At the same time, mechanized wells have been sunk on a widespread basis to draw underground water. Up to the end of 1974, the whole region already had 180,000 mechanized wells. The area of irrigated land has reached 13.5 million mu (constituting 41 percent of cultivated land), 60 percent are supplied by underground water. In some individual regions (such as Hengshui, Jixian, Zaoqiang areas), wells are too densely populated, too much water has been drawn, the underground water level has dropped drastically to 10 to 20 meters, forming a funnelling phenomenon. While controlling water, basic farmland construction was carried out. The land was deeply upturned and leveled. These efforts were combined with improvement of the soil to use the soil to retain water and to change large ridges into small ridges, to change large furrows into small furrows, and implement scientific irrigation so that the limited water sources could serve better to increase yield. As water conservancy develops and irrigation improves, the original alkaline and saline soil in the region has decreased to 7.56 million mu, and the degree of salinization and alkalization has been greatly reduced.

Food grain production is the main agricultural activity of this region. In 1973, the food grain fields constituted 77 percent of the total area of cultivated land. The rest of the land was used for planting cotton, oil bearing crops and such economic crops. Of the food grain crops, wheat is dominant, constituting 39 percent of the sowing area, followed by corn, sorghum, millet and potatoes. In recent years, to increase multiple planting and increase the

yield of food grains, the area of winter wheat has visibly expanded. Since popularization of hybrid varieties of sorghum, the area has changed from low yields fo high yields. Sorghum can also resist drought and avoid waterlogging, and it has gradually been expanded and its distribution is common. Corn is distributed more in high moisture regions where water and fertilizer conditions are good. Millet and broomcorn millet are distributed in arid and infertile regions. In addition, paddy rice and dryland rice are planted in small areas in the coastal regions.

In recent years, interplanting and companion planting have been popularized. The multiple planting index of the cultivated land of the region has greatly increased from that before controlling the Hai River, generally reaching 150 to 165 percent. In 1974, about 52 percent of the cultivated land was double cropping a year, 4.5 percent triple cropping a year, and the rest was one cropping a year or triple cropping in 2 years. At present, the level of agricultural production of this region is still lower than that in the high yielding regions of the alluvial fan of the foothills such as Shijiazhuang, Baoding, and Tangshan. In 1973, the average per mu yield of food grains of the entire region was 294 jin, equivalent to only half of the average per mu yield of the Shijiazhuang region, lower than the provincial average by 29 percent, and the region is still the "dragging" region in Hebei Province. To realize large scale increases in food grain production in this region within a relatively short period and to gradually build this region into a national commercial food grain base, the conditions of agricultural production must be greatly improved and there is also a lot of work in many other aspects.

1. Rationally Develop and Utilize Water Resources Further

This is the key measure to greatly develop agriculture in this region. At present, the utilization of ground surface water resources is still not fully sufficient. Underground water sources can still be further developed. Water conservancy projects in farmland still need to be completed. Comprehensive utilization of canals, reservoirs and wells should be carried out in a big way, and storage of water, sinking of wells, drawing of water, carrying water and drainage should be carried out simultaneously. The presently available mechanized wells should have complete machinery, newly mechanized wells should be rationally distributed and should not be overly concentrated. These efforts should be suited to local circumstances to combine the deep, the medium and the shallow, and to sink wells layer by layer so that every well will be a successful well and every well will be a complete well so that they can fully develop their practical function and gain.

2. Strengthen Improvement of the Soil, Fully Utilize Land Resources

The potential of land resources in this region is rather great. At present, there is 8 million mu of saline and alkaline wasteland and fallow and scattered wasteland which have not been utilized. After gradual improvement, the cultivated land can be expanded. In particular, the counties of Huanghua, Yanshan, Haixing on the eastern coast have great potential for reclamation. They can be developed as key points while exploring water sources. Improvement of saline and alkaline land is an important task of basic farmland construction. It

should be centered around water conservancy measures. The underground water level should be lowered, waterlogged conditions and salt should be drained, and at the same time, efforts based on micro-landforms, soil texture and degree of salinity and alkalinity of the different sections of land should be combined with the local planting system to suit measures to local circumstances and to implement agricultural measures to utilize the land so as to firmly establish the effects of desalting by water conservancy measures, to preserve moisture and nurture the land to realize increased yields. Practice of many years proves that raised fields and strip fields are also effective measures to improve saline and alkaline land, and they can be continuously popularized. Also, in this region, the cumulative temperature $\geq$ 10°C can reach 3,000°C to 4,500°C, and the frostless period is 200 to 225 days. These can satisfy the demands for heat of double season crops. But at present there is still over 40 percent of cultivated land in the region that produces one crop a year or three crops in 2 years. The utilization of heat is not full enough and therefore conditions should be created to gradually increase the multiple planting index.

3. Greatly Develop Hog Raising To Accumulate Manure; Actively Expand the Planting of Green Manure; Increase the Level of Fertilization

The experience of hog raising of the Kuizingzhuang Brigade of Jingxian can be popularized. Each production team manages the land for feed crops for hog raising and actively helps commune members raise hogs so that each family has a pig pen. Such green manure crops as sesbania, alfalfa, false indigo, clover can be planted more, utilizing fallow and scattered land to improve the soil and bank fertilizers for stimulating increases in food grain production.

4. Suit Measures to Circumstances, Adjust Crop Distribution

In regions where conditions of water, fertilizer, human labor and animal labor are good, winter wheat and early maturing crops can be actively expanded. This can avoid waterlogging and produce stable yields and can also increase the rate of land utilization. Corn is not tolerant to drought, waterlogging and alkalinity. Its yield will drop drastically as soon as it encounters disaster. Its yield is not stable. It can be appropriately suppressed and replaced with hybrid sorghum. Sorghum has a strong adaptability. It is more stable yielding, and it can solve the problems of fuel for the masses and materials for construction. Sweet potato is a high yielding crop but there is the fear of waterlogging. It should be appropriately developed at places where drainage conditions are good. In lowland regions affected by salinity and alkalinity, such alkaline tolerant crops as sesbania can be appropriately popularized as well as alfalfa, false indigo, vitex, and wolfberry.

Through the above measures, the production of food grains of this region can be expected to increase by a greater extent. If the average per mu yield of food grains of the entire region can surpass 500 jin, then the total yield can reach 11 billion jin, and this will provide 2 billion jin of surplus food grains, making basically this region into a commercial food grain base.

5. New Commercial Food Grain Bases in Border and Remote Provinces and Regions

Besides the new national commercial food grain bases, there are also many new provincial commercial food grain bases that have been established in the provinces and regions since the founding of the nation. Of these, the commercial food grain bases established in border provinces and regions are significant to the establishment of national defense and strengthening of war preparedness. The following key points will describe the new bases in the Ili River Valley, Tsaidam Basin and Yalu Tsangpo River Valley in the provinces (autonomous regions) of Xinjiang, Qinghai and Xizang. The original foundation of the new bases in these provinces is weak and the conditions of agricultural production must be greatly improved. There are less people, there is a shortage of labor, more agricultural machinery has to be equipped, and, the border provinces and regions are all residential regions of national minorities and livestock industry occupies a larger proportion. Therefore the management and construction of commercial food grain bases must take into consideration the question of the combination of promoting agriculture and the livestock industry.

(1) Ili River Valley

This region is situated in the mountain regions of Tianshan in western Xinjiang. The topography is high in the east and low in the west, forming a triangle opening to the west. The valley is 500 to 1,000 meters above sea level. The mountains on the south and the north sides are over 3,000 meters in elevation. Because of the arrival of water vapor from the Arctic Ocean, the annual rainfall is 400 to 600 millimeters. The seasons are distributed evenly. There is no serious drought and waterlogging. The annual runoff of the Ili River is 16.9 billion cubic meters. The Ili River is the first and largest river in Xinjiang. There is wide and flat terrace land. Irrigation is convenient. The soil is mostly relatively fertile serosem. Salinization and alkalization do not easily occur. These conditions are superior compared to all of the regions in Xinjiang. The entire region includes the one city and eight counties under the jurisdiction of the Ili Kazakh Autonomous Prefecture and some state run farms and original production and construction corps farms. There are definite regional differences within the region. The three counties of Ining, Huocheng, Chabuchaer and Ining City are agricultural regions. The two counties of Gongliu and Xinyuan are agricultural and animal husbandry regions mainly engaged in farming. The three counties of Zhaosu, Nileke and Tekesi are located at a higher elevation and are mainly engaged in livestock.

The area of cultivated land collectively owned by the communes of the region is about 5.36 million mu. In 1973, the sowing area was 4.96 million mu, and the multiple planting index was 93 percent. There is also 1.7 million mu of dryland on the mountain slopes of the 2 sides of the valley. This land is left to waste in rotation and cultivation is not permanent. It is not included in the area of cultivated land or the sowing area. The sowing area of the various production and construction corps farms is 1.4 million mu. In 1973, the population of the whole region was 1.1 million. The communes' agricultural population was 604,000. Each laborer worked an average of 27 mu. The communes of the entire region had 3.09 million head of large and small domesticated animals. Draft animals numbered 150,000. Each draft animal worked an average of 36 mu.

This region is situated towards the north and heat conditions are poor. In general, multiple planting is not possible. The types of crops are rather simple. In 1973, food grain crops constituted 86 percent of the total sowing area. Wheat constituted 68 percent, winter and spring wheat each constituted one half. Winter wheat is planted in the lower valley of the lower reaches in the west. Spring wheat is planted in the valley of the upper reaches of the east, followed by corn and some barley, beans, millet and cereal grain, buckwheat, and potato. The 40,000 mu of paddy rice are concentrated in the Ining and Chabuchaer region. The Ili River easily overflows. If reservoirs are built at the upper reaches to control the flow, then the river beaches at the lower reaches will be a suitable place to expand the planting of paddy rice. The area of economic crops constitutes 9.7 percent of the total sowing area mainly of linseed followed by rape. The oil bearing crops of this region are self-sufficient and there is a surplus. Each year, 4 to 5 million jin can be submitted.

Fertile soil developed from the piling of loess on the slopeland of the flood deposition fan at 1,200 to 1,500 meters above sea level on the two sides of the valley in the Zhaosu and Tekesi areas in the south. This region's annual rainfall reaches 500 to 600 millimeters. Even without irrigation, dryland crops can be planted. In ordinary years, spring wheat and rape are sown over 800,000 to 1.2 million mu. The harvests are determined by the amount of rainfall. In ordinary years, the per mu yield of spring wheat is 40 to 80 jin. In years of more autumn rain, winter wheat and potato can be planted. This type of rotational resting of dryland possesses the characteristic of "nomadic agriculture." It conflicts with grazing and livestock. Ways should be found to establish it firmly.

At present, life of this region "depends on Tianshan." The water from melting snow on Tianshan is mainly utilized. The land near the mountain and water has convenient irrigation. Along the Ili River, carrying water for irrigation has not been developed, thus good water resources flow into the Soviet Union. The area of irrigated land at present constitutes 67 percent of cultivated land. Paddy fields constitute 1.3 percent. Basically, the primitive method of using a massive amount of water for flood irrigation is practiced. Each mu consumes 1,200 to 1,300 cubic meters of water. This is too wasteful and it also causes loss of water and soil. The over 3 million head of livestock in this region are a big source of organic fertilizers, but the animals are all in the mountain regions grazing, far away from the agricultural regions and the collection and transportation of animal manure are inconvenient. In the farming regions, the people are mostly Islamic nationalities and hog raising is not developed. In 1974, there was only one head of hog per 120 mu of cultivated land on the average. Ordinary farmland is scarcely fertilized. Planting is also not refined and the production of food grains is not high. In 1973, the total yield was 690 million jin, an average per mu yield of 162 jin. But the levels of the various localities in the region are vastly different. In the valleys where water conservancy facilities are better, the labor force is more abundant, planting is more intense, and in recent years, unit yield of food grains has increased rather quickly. For example, the Mengjin Commune in Huocheng County changed equidistant sowing of winter wheat to narrow and wide row sowing and

the per mu yield surpassed 500 jin. Broadcast sowing of corn was changed to row seeding and the per mu yield surpassed 1,000 jin. Broadcast sowing of paddy rice was changed to transplanting seedlings and the per mu yield surpassed 1,000 jin. In 1974, there were 10 production teams in suburban Ining City that produced an average per mu yield of over 1,000 jin. It can be seen that the potential for increasing yield is very great. Also, per mu yield of winter wheat is higher than spring wheat by 50 to 60 jin. In recent years, winter wheat has been popularized. This is also an effective measure to increase yield.

The western area of Huocheng and Chabuchaer of this region was originally settled by the Mongols. As early as 1761, the Manchu government sent Manchus, Sibos and Solons from the northeast to settle and reclaim the land. Later, Kazakhs, Uighurs and Chinese moved into the region one after the other and the scale of reclamation expanded. The name Chabuchaer means "grain storage" in Mongolian and the county has always been a major grain producing region. In 1973, per capita farming population of the entire region had an average of 1,140 jin of food grains, each agricultural laborer produced an average of 3,440 jin of food grains, the region is self-sufficient and there is a surplus. During the 4th 5-Year Plan, the communes and corps farms of the whole region provided an annual average of over 300 million jin of food grains as state purchases. The commodity percentage reached 33 percent. Besides supplying the nonfarming population within the region, there is a surplus for supporting the industrial and mining cities of Karamai, Dushzi and Urumchi in northern Xinjiang. A small portion is shipped to southern Xinjiang via Xinyuan. The economic crops of this region also occupy a definite position in the whole of Xinjiang. For example, the yield of linseed constitutes 30 percent of that of the entire autonomous region, rape constitutes 11 percent, and the region is an important oil bearing crop producing region in Xinjiang. The sugar content of beets is as high as 17 to 23 percent, the highest in the nation, and the future for development is bright. At present, only a small amount is planted near the Gongliu Sugar Refinery. The autonomous region is preparing to build a large sugar refinery with daily capacity of 1,000 tons at Huocheng. This requires expanding the planting area of beets to 300,000 mu. Therefore, further development of food grain production must take into consideration the problem of rotational planting of beets.

The direction of the development of production in this region is to become the major commercial food grain base in Xinjiang and also to become the livestock industry base centered around fine wool sheep and a concentrated region producing economic crops (oil bearing crops, beets). Further development and construction must grasp well the following aspects.

1. Strengthen Water Conservancy and Basic Farmland Construction, Increase the Rate of Utilization of Present Cultivated Land

Future development should be mainly to increase the unit yield of presently available cultivated land. This should be established on paddy fields. Basic farmland construction centered around controlling water and improving soil should be done in a big way. The land should be leveled and prepared, fertilization should be increased to reform the low yielding fields. Overall planning to

realize garden farming should be carried out by rationally arranging strip fields, canals, roads, forest zones and residential locations. Strip fields should be 150 mu as the most suitable. Conditions must be created actively on the dryland of mountain slopes. Mountain and spring water should be stored for irrigation. Spray irrigation could also be developed on a trial basis. Dryland fields should be changed to paddy fields and the custom of letting land lie waste must be overcome to change the land into permanent irrigated land. The autonomous prefecture has planned to build a big water lifting station on the two banks of the Ili River to draw river water to solve the problem of irrigation at Gongliu and Chabuchaer. Wells should be sunk at higher mesas to actively develop underground water. At the same time, the method of irrigation should be improved, the use of water should be conservative, and the rate of utilization of water resources should be increased.

2. Steadily Develop Wasteland Suitable for Farming According to Plan

To better develop the function of this region as a commercial food grain base, besides using and nurturing the presently available cultivated land, appropriate reclamation can be carried out when conditions warrant to plant more and to harvest more. According to estimates of balanced water and soil resources, the Ili River Valley still has 4 million mu of wasteland of good conditions suitable for farming. Most of this is distributed south of the mainstream and the tributary Kunes River. But further expansion of planting must be done carefully so as not to destroy the spring and autumn grazing fields, otherwise it will be unfavorable to the development of the livestock industry.

3. Strengthen Combination of Farming and Livestock Production

This region has wide expanses of natural grasslands. Water and grass are rich. These provide superior conditions for the development of livestock. This region is a base for fine wool sheep, Ili horse and the superior stock of the Ili white pig. It occupies a definite position within the nation. But at present, the livestock industry and agriculture within the region are basically managed as two separate and independent departments. This is definitely related to the composition of the national minorities. The main nationality in this region is the Kazakhs, living in the mountain regions and engaged in seasonal nomadic grazing. In the river valley regions are many other nationalities, the Chinese, Uighurs, Manchus, Sibos, mainly engaged in farming. Animal manure is mostly abandoned in the grazing fields of mountain slopes and a small portion is used as fuel by the nomadic people. Very small amounts are applied in farmland. The relationship between livestock production and farming is not close. Also, there are more conflicts in utilizing grazing fields, especially in mixed farming and grazing regions. In the future, as the area of reclamation and planting expands, the area of winter grazing fields will surely be suppressed. Therefore the quality of the natural grazing fields should be improved in time and grass bases should be established in grazing regions to enrich the material foundation of livestock production. Alfafa can also be planted in rotation utilizing dryland to supply the livestock industry as feed and to promote the organic combination of farming and livestock industry.

4. Elevate the Level of Mechanization

This region has more land and less people and the burden of the labor force is heavy. In 1973, there was only 1 tractor for every 4,000 mu of cultivated land on the average. Also, the forces of agricultural machinery and techniques cannot catch up, management is poor, maintenance is one factor affecting the increase in the level of production. In the future, machinery and vehicles and equipment should be increased, and at the same time, the function of new types of horse drawn farming equipment should be advocated and developed fully.

It is hoped that during the 6th Five-Year Plan, through changing of dryland into paddy fields and appropriate reclamation, the area of regularly cultivated land can expand to 6.6 million mu and of this 5 million mu can be used to plant food grains. Calculated at a per mu yield of 400 jin, the annual yield of food grains can reach 2 billion jin. This will satisfy the needs of the region and will also provide 1.2 billion jin of surplus grains a year, and the commodity percentage can be increased to 60 percent.

(2) Tsaidam Basin

Administratively, the Tsaidam Basin belongs to the Haixi Mongol nationality, the Tibetan nationality, and the Kazakh nationality autonomous prefecture, including four counties, three towns and one ward. In 1974, it had a population of 300,000, and the farming population was 113,000. The Tibetan, Mongol, Kazakh minority nationalities constituted 12 percent.

The basin is surrounded by mountains on the north, west and south. It borders the Qinghaihu on the east. The basin itself is at 2,600 to 3,200 meters above sea level. The total area is 318,900 square kilometers. The topography from the rim of the basin towards the center consists of: mountain land, hilly land, gravel gobi, earth gobi, desert plain of saline soil, meadow saline plain, bog saline plain, and salt lake, distributed in concentric rings. On the desert saline plain are many sand and willow tree pockets. Those with water sources have already been reclaimed. Present highways all pass through this region. Meadow saline plains are the major grasslands. At present they are reserved as land for livestock but are also possible targets for further reclamation. The area of grassland of the entire prefecture covers 135 million mu, 70 percent is desert grassland, and the usable area is 106 million mu. Natural forests cover 280,000 mu, less than 1 percent of the total area.

Before Liberation, this region was basically a grazing region. There was only a small plot of cultivated land in the east, totaling less than 1,000 mu. Per mu yield of food grains was only about 100 jin. In 1954, large scale reclamation was carried out at Delingha, Xiangride, Nomhon, Saishike, Garmu, and a state run farm was established (1966, the Garmu Farm was rebuilt as the agricultural construction division). In 1973, the cultivated land in the whole prefecture reached 664,000 mu (constituting 0.16 percent of the total area), 60 percent belonged to the state run farm, 13 percent belonged to the agricultural construction division, 27 percent belonged to the commune. According to the types of land, there are 630,000 mu of irrigated land, 33,000 mu of shallow

mountain land (i.e., low mountain slopeland), and creased mountain land (high mountain slopeland) of 1,000 mu. In 1973, the area of sowing in the 3 major systems of land totaled 540,000 mu. The multiple planting index was only 81 percent. In 1973, food grain crops were planted over 474,000 mu (mainly spring wheat, followed by naked barley and a small amount of potato). The per mu yield averaged 282 jin (spring wheat of 313 jin, naked barley of 202 jin, potato of 204 jin). The yield of state run farms constituted 66 percent of the total yield of food grains. It is the main force of agricultural production of this region. The unit yield is also higher. The entire region is self-sufficient in food grains and there is a small surplus. The commodity percentage of food grains in 1972 was 36 percent (the provincial average was 16 percent). In the region, the commodity percentage of the state run farm was the highest, 77 percent, and that of the commune system was 26.3 percent.

Industry is the center of production of this region. In 1974, the value of industrial production constituted 68.9 percent of the total value of agriculture and industry. Agriculture constituted 17.2 percent and livestock industry constituted 13.8 percent. Tsaidam has rich mineral deposits. It is known as the "treasure chest." Already mined are the salt and potassium in the salt pits of Chaka, Koko, Charhan, petroleum of Lenghu, lead and zinc of Xitieshan, and coal of Muli and Dameigou. In the future, as the Qinghai-Xizang Railroad pushes westward and as industrial and mining construction hastens their progress, the nonfarming population will necessarily increase greatly, and the need for food grains, vegetables and meat will continue to increase. In addition, consideration must also be given to supporting construction in Xizang. Therefore, viewing the trend of development, it is necessary to build this region into a commercial food grain base. Objectively, it possesses the following favorable conditions.

1) There is a large area of wasteland suitable for farming which can be utilized further. According to the survey done in 1973-1974 by the writing group of "Qinghai Agricultural Geography," this region has a total of 2.68 million mu of land suitable for farming. Except for the 664,000 mu that have already been reclaimed and cultivated, there are 2.02 million mu that can be sown. Of this, about half has good conditions, mainly distributed in Garmu, Xiligou-Saishike, Zongga-Balong, Chaganus, Xiangride, Nomhon and Urtmoron. If during the 6th Five-Year Plan the population in this region increases to 400,000 to 500,000, 200 million jin to 250 million jin of commercial food grains will be needed. On the present bases, places where water and soil conditions are good should be selected to expand planting to 300,000 mu so that the sowing area of food grain crops will reach 800,000 mu. If calculated at a unit yield of 500 jin, the total yield of food grains will be 400 million jin, not only satisfying the needs of the ever increasing population along with the development of industry, mining and transportation but also the amount of surplus grains transferred out of the province can be increased.

2) The climatic conditions are favorable to high yields of crops. Most of the residential locations and the regions of agricultural reclamation in this region are at an elevation of about 3,000 meters above sea level. The duration of sunshine is long (about 3,000 to 3,600 hours annually). The amount of radiation from the sun is large (the annual total radiation is between 163 and 177

kilocalories per square centimeter). The cumulative temperature ≥ 10°C is over 2,000°C. The seasonal temperatures ≥ 12°C is more than 50 days. The filling period of wheat is long. The day and night temperature difference is greater. Between June and August, it can reach 13°C to 16°C, favorable to accumulation of matter. Spring wheat will have large panicles, full grains, and its thousand grain weight will be higher than that of inland wheat by 30 percent. The root tubers of beets are large and their content of sugar can reach 17 to 21 percent. Also, the relative humidity of this region is low, and crop diseases are few.

3) There is also a definite experience in scientific planting. In recent years, the state run farms in the region have been planting experimental fields on a widespread basis. They have made definite achievements in increasing the unit yields. For example, the Nomhon Farm in 1971 produced a per mu yield of food grains that reached the "guideline." In 1973, an experimental field of 3.4 mu of spring wheat produced a per mu yield of 1,585.3 jin. For example, the Xiangride Farm produced a yield that reached the "guideline" in 1972, and in 1974, the experimental field of 2.1 mu of spring wheat produced a per mu yield of 1,577.5 jin. All of these are high yield records in the nation. In addition, the large areas of wheat fields of 100 to 200 mu that produce an average of 800 to 900 jin per mu are not rare. Tsaidam's spring wheat also produced high yields. The main experience is to select superior varieties, irrigate with a lot of water (8 to 9 times a season), apply a lot of fertilizers (apply 20,000 jin of mud fertilizers per mu during autumn upturning of the soil, apply 1,000 jin of human waste before sowing, and apply sidedressing of urea, calcium superphosphate and such chemical fertilizers), plant in high density (sowing of 50 jin per mu), and conscientiously carryout management measures. The favorable climatic conditions are also important factors to stimulate high yields.

But this region's agricultural production still suffers from the unfavorable natural conditions of drought, salinity, alkalinity, wind and sand, thus the following problems must be solved in view of further development.

1. Do the Work in Water Conservancy Construction Well

The climate of this region is dry. The annual rainfall at all localities is not more than 130 millimeters, and the least is only 1.5 millimeters. Strong winds occur in spring and summer. There is a lot of evaporation, and without irrigation, agriculture cannot develop. In ordinary years, the rivers that have water have a total runoff of 4.36 billion cubic meters. The amount of flow that can be effectively utilized is 2.71 billion cubic meters. The estimated dynamic reserve of underground water resources is 136.4 cubic meters per second. In addition, the water reserves of the ice rivers of Qilianshan are 7.4 billion cubic meters. Viewing the quantity, the water resources are rich, but because most of the rivers originate from the melting of ice rivers, there is not much water in May and June, and there is a shortage of water for irrigation. Frequently, one rotation of irrigation lasts several dozen days, therefore irrigation is not in time, often affecting the yield (a reduction of 20 percent). Also, the distribution of water resources and resources of land suitable for farming is not even, affecting development and utilization. The conflict between water and soil

is mainly water. The present water conservancy facilities are poor. Generally there is irrigation but there is no drainage. Most of the canals lack facilities to prevent leakage. The effective utilization coefficient is only 40 to 50 percent. In the future, hydraulic projects should pay attention to quality.

2. Prevent Secondary Salinization and Alkalization

The cultivated land of the region at present is mostly distributed in the desert saline and alkaline land. The soil is lacustrine phase sediment and the soil contains more salt and alkali. With the addition of the irrational use of water by most of the irrigated regions, a lot of water is used in flood irrigation, and the waste is serious. The underground water level rises quickly, and large expanses of land at the lower reaches become salinized and alkalized. Already 18 percent of the cultivated land has been abandoned because of this. This must be grasped tightly and controlled. In the future, expanded planting will reclaim the meadow saline soil regions at the lower reaches where the underground water level is even higher, and methods to dig deep ditches and to sink vertical wells to drain the water must be implemented, green manure must be planted, organic fertilizers must be upturned deeply and dried, irrigation should be done in winter to suppress alkaline and to prevent secondary salinization and alkalization.

3. Strengthen the Labor Force, Increase the Level of Mechanization

This region has expansive land and few people. Labor is lacking. Each laborer of the commune system works 12 mu of cultivated land. The burden of the state farms is heavier. Besides maintaining ordinary reproduction, there is no more strength to engage in basic farmland construction and water conservancy construction. In the future, development of industry, mining and transportation in this region will hasten. A part of the labor force must be absorbed from the agricultural front. Therefore strengthening front line labor in agriculture is urgent. Besides organizing intellectual youths to participate or establish youth farms, people in the farming regions in the eastern parts of this province should be organized into teams and relocated. But the most fundamental method is to hasten the elevation of the level of mechanization.

4. Combine Agriculture and Livestock Well

There are over 100 million mu of grassland that can be utilized in this region. In 1973, there was 2.62 million head of large and small domesticated animals. The population engaged in the livestock industry totaled 27,000, and this region is one of the main grazing regions in Qinghai Province. In the future, construction of the commercial food grain base will occupy part of the better grazing fields. If this is not handled well, livestock production will be suppressed. Therefore, the policy of "taking food grains as the key link, overall development, suiting measures to local circumstances, appropriate concentration" must be conscientiously implemented. While expanding the planting of food grains, consideration must be correspondingly given to establishing grass bases to serve livestock and to build grassland water conservancy projects, improve the quality of grasslands, strengthen the material foundation of livestock, and promote the development

of the livestock industry. In this region, the fuel supply is more convenient near coal mines, but at most places, shrubs in sandy regions are taken and uprooted, causing serious damage. Shifting sand invades farmland and grazing fields, and in the future, expansion of planting must pay attention to the protection of vegetation to prevent disasters.

In addition, the level of cultivation of this region at present is very low. Damage by weeds is serious and this must be improved, such as changing broadcast sowing to wide row seeding to facilitate intertilling and weeding, changing late spring sowing to early spring sowing and even sowing in icy conditions just before thawing begins in early spring, changing spring irrigation to winter irrigation, and at the same time, applying fertilizers to hasten maturation, and lessening the conflict of competition for water during spring drought. All of these will benefit elimination of reed and such weeds. The use of compost and dunghills can also effectively increase the unit yield of food grains.

(3) Valley of the Middle Reaches of the Yalu Tsangpo River

The river valleys of the middle reaches of the Yalu Tsangpo River in southern Xizang and its major tributaries, Lhasa River, Nyangchu River and Nyang River, administratively, include Lhasa City and the 24 counties of the 2 regions of the Shigatse Prefecture and Loka Prefecture. This region is our nation's important food grain producing region of the southwest border region. In 1974, the population in the farm villages constituted 54 percent of the total in Xizang (same as below), the labor force constituted 51 percent, the cultivated land constituted 46.7 percent, and the yield of food grains constituted 60.4 percent. Concentrated here is the best and the largest area of farmland in the whole of Xizang and there are broad grasslands and rich forest resources. But before Liberation, under the long period of rule of reactionary dark feudalistic serfdom, production was very backward. Per mu yield of food grains was only over 100 jin. Since the democratic reform in 1959, production conditions were changed, agricultural techniques were reformed, the scale of production was expanded, and continued bumper harvests were realized. In 1974, the two counties of Jiacha and Chhonggyae and many communes produced unit yields of food grains that reached the "guideline" or surpassed that of the "Yellow River" (regions). The average per mu yield of the whole region was 282 jin. Each person had an average of 809 jin of social grains [4752 7380 4357 2585]. In the 3 counties of Gyantse, Panam, Shigatse, each person had an average of 1,000 jin of food grains. In the wide valley segment of the Yalu Tsangpo River and the lower reaches of the Lhasa River and Nyangchu River where the elevation is generally 3,000 to 4,100 meters above sea level, the conditions of heat, water and soil are good. There are more people. Transportation is convenient. Planting is the main agricultural activity. The value of production constitutes 70 to 80 percent of the total value of agricultural production. In planting, the production of food grains is the main activity. Food grains occupy over 90 to 95 percent of the total sowing area. This region is the most important commercial food grain base of the autonomous region. In particular, the commodity percentage of food grains of the counties of Nedong, Jiacha, Gongkar, Chhonggyae, Chusung, Gyantse, Panam, Lhatse is all above 20 percent, and at some places, it reaches as high as 30 percent.

This region is one of our nation's concentrated planting areas located at the highest elevation. It belongs to the "high and cold agricultural region." Because the topography is high and cold, agriculture is mainly spring sown single cropping a year. The varieties of crops are few. Naked barley, spring wheat and peas are the three main crops that are dominant. In recent years, the area of winter wheat has constituted 36.6 percent of the sowing area of wheat, the yield has constituted 39.5 percent of the yield of wheat, and there is a trend of further expansion. The upper limits of planting of the various food grain crops are continuously being elevated. At present, the upper limit of winter wheat has already reached 4,100 meters, and that of spring wheat has reached 4,400 meters, that of potato has reached 4,650 meters, and that of spring naked barley has reached 4,800 meters, the highest upper limits of planting in the world. This fully demonstrates the revolutionary spirit of the laboring people of Xizang to utilize and reform nature. They have accumulated a high experience in the development of our nation's agriculture in high and cold regions. Potato, buckwheat, millet, corn, paddy rice, sorghum, broad bean and economic crops of beets, tobacco and sunflower have been introduced into the valleys at lower elevations and definite areas have been planted, changing the situation of singular plateau crop varieties.

The distribution of crops in this region extends from east to west, and it is characterized by visible vertical variation from the low elevations to the higher elevations. The most outstanding characteristic is that winter wheat is mostly distributed in the east where the elevation is lower while spring naked barley is concentrated in the west at a higher elevation. The general pattern is that the proportion of winter wheat continues to decrease at higher elevations and the proportion of spring naked barley increases (as shown in Table 4-8). Of course, the proportion of the various crops is limited by natural conditions and it is also affected by the needs of the national economy and socioeconomic conditions.

Table 4-8. Analysis of the Variation in the Structure of Food Grain Crops in the Valley of the Middle Reaches of the Yalu Tsangpo River in Xizang

Region	Item	Various food grain crops as a percentage of the sowing area (percent)				General elevation of valley above sea level (m)
		Spring naked barley	Spring wheat	Winter wheat	Pea	
Eastern part	Linzhi	34.2	19.1	36.6	9.0	3,000-3,500
	Milin	35.4	18.1	46.8	8.8	
	Jiacha	40.3	--	56.8	0.5	
Western part	Rinpung	59.2	13.8	0.37	26.4	4,000-4,500
	Shigatse	44.3	19.1	0.05	34.9	
	Sakya	67.2	.4	0.1	22.0	
	Lhatse	65.5	11.2	1.3	22.0	

In 1974, the unit yield of food grains was higher than that of the whole of Xizang by over 23 percent, but the development between regions is not balanced. The number of counties among the 24 counties throughout the region that produced an average per mu yield of over 400 jin constituted 6.8 percent, those producing a per mu yield of 350 to 400 jin constituted 7 percent, those producing a per mu yield below 250 jin constituted 35.4 percent. Food grain production is low and unstable in the high and cold regions of the upper reaches of the various rivers at an elevation above 4,100 meters where there are expansive land and few people, where the planting is not refined, and where there are more natural disasters such as frost and freezing. The per mu yield is only 100 to 200 jin. Each person has less than 600 jin of food grains, only self-sufficient or basically self-sufficient. Here, the proportion of livestock is higher, and it has moved from the farming regions in the valleys to the plateaus and mountain grazing regions.

The potential for increased production of food grains is greater. Most of the cultivated land in the region is alluvial soil, the fertility is high, and the number of domesticated animals is large. This has not only provided agriculture with sufficient animal labor force, but it has also provided a massive amount of organic fertilizers. There are also large expanses of wasteland suitable for farming in the major river valleys and the broad lake basins. As long as necessary measures are taken, the possibility of expanding the cultivated land is great. The photosynthetic potential of this region is great. According to estimates of the photosynthetic potential of solar energy at Shigatse and Gyantse, the per mu yield of food grains can reach 3,200 jin. In addition, on the southern slope of the Himalaya Mountain and at Linzhi, Milin, Nang, Jiacha in the eastern part, it is warm and there is a lot of rain, not only suitable for the growth of corn, but there are also 1 to 2 months of remaining growth period after harvesting of winter wheat. It is possible to implement companion planting or short term multiple planting and triple cropping in 2 years or double cropping a year.

Because this region is situated in the southwest border defense area of our nation and also in the heartland of Xizang, in the future, the development of socialist revolution and construction will make even higher demands upon food grain production. Therefore, it is necessary to grasp the major problems in production and take the following effective measures to promote greater development of food grain production to establish a firm material foundation for fortifying the border areas, strengthen national unity and build a new socialist Xizang.

1. Develop Basic Farmland Construction Centered Around Water, Fertilizer and Soil

Forty-nine percent of the food grain fields of the whole area of Xizang are concentrated in this region. The per mu yield of food grains of the various places in the region varies. The per mu yield of food grains of most of the counties remins at 200 to 300 jin. In recent years, water conservancy has developed rapidly. Gravity irrigation covers 70 to 80 percent of the farmland.

But the degree of assured irrigation is not high. The area of high and stable yielding farmland is less than one-fourth of the present cultivated land. At most of the places, the ability to resist disasters is poor. For example, in 1975, the rainy season was late, the river water level dropped, several hundred thousand mu of farmland in this region had missing seedlings, devastated seeds and land was even left to waste because of summer drought. To assure stable and high yields, emphasis should be placed on the problem of the source of water for irrigation. Measures must be suited to local circumstances to handle the relationship among storing, drawing and darrying water. The rich experience accumulated by the people of this region to cut through mountains to lead in water, dam rivers and dig canals, develop irrigation, increase the ability of the land to resist drought and expand reclamation for farmland should be continuously developed, such as utilizing ice rivers and lakes and seas on plateaus to store water, build dams spanning mountain bends to draw water at wider sections of river valleys (utilizing the favorable topography of mountain bends on the one hand and building embankments on the other), build dams, develop underground water, develop irrigation by carrying water utilizing favorable topography in regions along rivers, utilize winter to accumulate and store snow and water, and perfect the irrigation system. These efforts should be combined with building water conservancy projects, leveling and preparing land, building terrace fields, and improving soil to gradually realize garden farming and create conditions for agricultural mechanization.

This region has a lot of livestock. The sources of fertilizers are broad, but at present, they are not fully utilized. Most of the manure is used as fuel (in many regions, each person burns an average of 1,000 jin of dried dung a year), therefore the level of fertilization is low. On the average, each mu is only applied 1,000 to 2,000 jin of farmhouse manure and 3 jin of chemical fertilizers. Thus, to solve the problem of fertilizers the problem of fuel must first be solved. In the future efforts should be combined with controlling the mountains and water, utilizing uncultivated mountains and wasteland to plant forest belts to prevent wind and sand with trees for firewood and timber according to plan, to solve the problem of logs for burning and timber and change the old habit of burning cattle and sheep dung, and at the same time, to expand forestry and sideline production.

2. Suit Measures to Local Circumstances To Expand Winter Wheat, Rationally Adjust the Composition of Crops

Winter wheat can be planted in areas in this region below 4,100 meters where water conditions can be assured. The unit yield is about 400 jin. At some places, it can reach over 600 jin. For example, the Pengbo Farm planted 11.6 mu of winter wheat in 1973. The average per mu yield was 1,339 jin. In 1975, the unit yield of the small area of winter wheat planted by the Guantse Farm reached 1,610 jin, creating our nation's highest record of per mu yield of winter wheat. Large scale practice proves that the unit yield of winter wheat in this region can be higher than that of other food grain crops by 30 to 40 percent, and even by onefold.

Because this region is situated on a plateau, the summer temperatures are not high, and the whole growth period of winter wheat is much longer than that in the wheat regions in the eastern plains, as shown in the following table:

Region	Growth Period (day)
Winter wheat region of the Xizang Plateau	
Linzhi (3,000 meters)	300
Shigatse (3,800 meters)	350
Gyantse (above 4,000 meters)	370
Winter wheat region of the eastern plains	
Beijing	270
Nanjing	219
Changsha	191
Guangzhou	122

Because the growth period is long, the rate of effective utilization of light and heat is increased. Also, because the intensity of solar radiation on the plateau is strong (for example, at Shigatse, the total annual radiation averaged over many years is 191.8 kilocalories per square centimeter, the effective annual radiation which can be utilized by crops for photosynthesis is 90.15 kilocalories per square centimeters, one-third higher than Beijing). The duration of sunshine is long, reaching over 3,000 hours, and the difference between daytime and nighttime temperatures is large, beneficial to the accumulation of photosynthetic products, therefore, the thousand grain weight of wheat is generally higher than that of the various localities of the east (for example, the winter wheat of the southern part of the Shigatse region averages 40 to 50 grains per panicle, the thousand grain weight is 40 to 50 grams, while in Beijing, they are respectively 20 to 30 grains and 35 to 40 grams). Therefore, expanding the planting of winter wheat can effectively promote large scale increases in the yield of food grains. For example, one of the major experiences of producing a unit yield of food grains that reached the "guideline" in Jiacha County was to actively expand the planting of winter wheat. The area of planting of winter wheat in that county constituted 56.7 percent of the area of food grains and the yield constituted 71.9 percent. At present, winter wheat in the major river valley regions in the Lhasa and Loka regions in the east constitutes 30 to 50 percent of the area of food grains. In the near future, the main efforts are to firmly establish the area and increase unit yield. In the west, in the Shigatse region, winter wheat generally only constitutes 10 percent of the area of food grain crops, and at some places it has only begun to be test planted. These are key regions for development. As winter wheat is being developed further, besides actively carrying out water conservancy construction in farmland and improving water, fertilizer and soil conditions, attention must be paid to increasing the quality of sowing and strengthening management of wintering to assure stable and high yields. At the same time, consideration must also be given to the proportional relationship with other crops, implementation of rational rotational planting and combination of efforts with the use and nurturing of land.

According to the survey of the Xizang Scientific Survey Team of the Chinese Academy of Sciences, in the regions suitable for planting winter wheat under present conditions, the planting area at most should not surpass 60 percent of the area of food grain crops, otherwise, it will not be favorable to the use and nurturing of land, it will not be favorable to the adjustment of labor, and the supply of feed grass will be affected. In addition, the winter wheat variety being popularized at present is mainly "fei mai." In general, it possesses a strong resistance to cold and it has a good bumper harvest characteristic, but in warm and damp regions below 2,800 meters, it is easily affected by disease and the yield is unstable. In regions at an elevation of 3,900 to 4,000 meters, dying seedlings occur seriously, The growth period is over 350 days, and there is difficulty in continuous planting. Therefore, in the future, some early maturing new varieties that are resistant to disease and cold and that have a shorter growth period and good bumper harvest characteristics should be selected, introduced and bred in these two types of regions to change the singular variety of winter wheat at present.

Second, this region has expansive land and few people. There is a shortage of labor. Farm implements are simple. Planting is unrefined. The method of production is rather primitive. therefore, reforming the farming implements, hastening agricultural mechanization and semimechanization, increasing the level of planting techniques, changing broadcast sowing to row sowing, strengthening interplanting and weeding, and popularizing experiment work in superior varieties of high yielding crops can all increase the labor production rate of this region and create conditions for food grain production.

[pp 186-189] [Excerpts]

Chapter V Question Concerning Rational Distribution of Our Nation's Production of Economic Crops

Section 1 Basic Characteristics of the Distribution of the Production of Economic Crops and Major Problems

Table 5-1 Composition of the Sowing Area of Economic Crops of Past Years (Percent)

Crops \ Year	1952	1957	1965*	1971	1978
Economic crops	100.0	100.0	100.0	100.0	100.0
1. Cotton	44.6	40.0	41.0	41.3	33.7
2. Oil bearing crops	45.7	48.0		40.1	43.1
Peanuts	14.4	17.5	15.1	15.0	12.2
Rapeseed	14.9	15.9	14.9	13.5	18.0
Sesame	8.5	6.5	5.4	5.0	4.4
3. Bast fibers	4.1	4.5		3.8	5.2
Corchorus capsularis, Hibiscus cannabinus	1.3	1.0	0.9	1.1	2.9
4. Sugar crops	1.7	2.9	4.3	5.4	6.1
5. Tobacco	3.5	3.6		3.6	5.4
Flue cured tobacco	1.5	2.5	2.7	2.7	4.2
6. Other	0.4	1.0		5.8	6.5

*Items for the 1965 statistics were incomplete

2. Basic Characteristics of the Distribution of the Production of Economic Crops in Our Nation

(2) Centralized Production Areas and Scattered Production Areas Are Mixed

Our nation's production of economic crops include centralized production mainly for commercial production and widespread scattered production characterized by production for self-supply. The two are combined. In distribution they reflect the characteristic of a centralized production region and scattered production regions. The two are mixed but the former is dominant.

This characteristic is first reflected in the regional distribution of the sowing area of economic crops throughout the nation. For example, in 1975, the total sowing area of economic crops throughout the nation was 200 million mu distributed throughout each province, city and autonomous region. Sowing areas of over 10 million mu are found in Shandong, Henan, Hebei, Hubei, Guangdong, Sichuan, Jiangsu, and Anhui provinces, totaling 120 million mu, constituting about 60 percent of the total. In these provinces, the areas of economic crops

all constitute above 13 percent of the area of cultivated land of each provin[illegible] Guangdong Province has the highest percentage, 28.6 percent. Areas of economic crops under 1 million mu are found in Beijing, Tianjin, Qinghai and Xizang, totaling 20.94 million mu, less than 1 percent of the total area. The areas of economic crops in these provinces and cities all constitute less than 10 percent of the area of cultivated land. The highest is in Beijing City, but only 9.7 percent. The percentage is the lowest in the Xizang Autonomous Region 4.1 percent. It can thus be seen that the centralized production regions and scattered production regions are very visible.

Centralized production regions and scattered production regions can also be clearly differentiated from the distribution of a certain economic crop. For example, among the economic crops, rape is the most widely distributed. At present, except for Jilin Province which has successfully test planted it but it has yet to be popularized, it is planted in all provinces and regions of the nation. But its distribution is most concentrated in the provinces of the Changjiang River Valley, especially in Sichuan, Anhui and Hubei provinces which produce the most and they are the central production regions nationally. The other provinces and regions are mostly scattered production regions for self-supply.

The concentrated and scattered situation of economic crops can be divided into the following types: 1) widely scattered and widely concentrated, as represented by cotton, rape, peanuts and such crops; 2) Minimally scattered and concentrated, as represented by rubber, coffee, pepper, oil palm, coconut, special medicinal herbs and such tropical crops; 3) widely scattered and minimally concentrated, as represented by bast fibers, tobacco, sugar crops. These types are mixed throughout the nation.

3. Two Important Questions on Further Developing Economic Crops

Crops \ Year	1949	1952	1957	1971	1978
Cotton	100	294	370	475	487
Corchorus capsularis, Hibiscus cannabinus	100	825	813	737	2599
Peanuts	100	183	203	176	187
Rapeseed	100	127	121	168	266
Sesame	100	147	96	[illegible]	147
Sugar cane	100	270	394	500	799
Beets	100	250	787	1007	1418
Tea	100	202	272	372	652
Flue cured tobacco	100	515	595	1007	2453
Silkworm cocoons	100	200	220	485	561

[pp 192-196] [Excerpts]

Section 2 Cotton

1. Description of the Development of Our Nation's Cotton Production

After Liberation the party and government placed much emphasis on cotton production. They implemented a series of policies to encourage the planting of cotton. The old cotton regions were revived and developed and new cotton regions were developed. Great achievements in cotton production were realized. In 1957, the area of cotton plantations throughout the nation reached 86.63 million mu, an increase of 108 percent over 1949. Per mu yield increased to 37.9 jin, an increase of 75 percent over 1949. Total yield reached 32.8 million dan, an increase of 2.7 times over 1949. After 1959, serious natural disasters continued for 3 years, the level of agricultural production dropped, cotton fields shrank, yield dropped sharply. In 1962, cotton fields decreased to over 52 million mu, the total yield of cotton dropped to 15 million dan. Beginning from the end of 1962, Premier Zhou personally grasped cotton production and held the first national cotton production conference to conscientiously resolve the conflict between food grains and cotton and further implemented the policy of encouraging the planting of cotton. The area of cotton fields returned to 75 million mu. In 1965, cotton production reached 41.95 million dan. Since 1965, cotton production gradually increased steadily. During the 3rd Five-Year Plan from 1966 to 1970, the area of cotton fields remained at about 74 million mu for 4 of the 5 years. Total yield remained above 45.5 million dan. Because of the interference and sabotage by Lin Biao and the extreme leftist line of the "gang of four" and the effects of natural disasters, cotton production dropped continuously in 1971 and 1972. In 1973, the Central Committee further strengthened the leadership in cotton production and conscientiously implemented Premier Zhou's important directive concerning cotton production to "strengthen leadership, rely on the masses, distribute rationally, appropriately concentrate, summarize experience, popularize techniques, assure area, increase unit yield." The yield of cotton increased on a large scale again. In 1973, the area of cotton fields reached 74.13 million mu, average per mu yield was 69 jin, total yield reached 51.237 million dan, surpassing that of any past year. Our nation became the world's largest cotton producing nation.

According to incomplete statistics, there were 16 regions (cities) that produced the quota of the national "guideline" in 1973 and 148 counties that produced the quota of the national "guideline." The average per mu yield of the cotton fields of Jiangsu Province was over 100 jin, becoming our nation's first province to produce 100 jin of ginned cotton. Communes producing over 150 jin per mu, brigades producing over 200 jin and production teams producing over 250 jin emerged throughout the nation. In 1974, after conquering serious natural disasters, our nation's cotton still achieved good harvests. Ten ginned cotton producing regions with yields of 100 jin including Nantong in Jiangsu, Jingzhou in Hubei and Changde in Hunan emerged. In particular, Hubei Province which was one of our nation's major commercial cotton bases, greatly increased production in 1973, and on that basis, production was increased again in 1974, becoming another of our nation's provinces to produce 100 jin of ginned cotton. But on

the other hand, for the past few years, because of the interference and sabotage of the "gang of four" and the effects of their remnant poison, the distribution of cotton in some regions became scattered, and the yields dropped. In some cotton regions the unit yield of cotton dropped to the level at the beginning of Liberation. Generally speaking, from 1949 to 1977, there were 14 years of increased cotton production and 14 years of decreased cotton production. Between 1965 and 1977 during a period of 13 years, the yield of cotton stagnated except in 1973, and the yields tended to decrease, even dropping to the level of 1965. In 1978, cotton production rose slightly. There were 72.996 million mu of cotton fields, the per mu yield was 59 jin, the total yield was 43.34 million dan. At the same time, the development of the regions of cotton production was also very uneven. Especially in most of the concentrated cotton regions in the north, the area of cotton and cotton as a proportion of the area of cultivated land both decreased while the area of cotton of scattered cotton regions expanded. This is a very irrational phenomenon.

The problems that exist in cotton production in our nation at present include irrational distribution and uneven production and development of the cotton regions as mentioned above, but the main problem is a very low unit yield of cotton, affecting increases of the total yield and the needs of developing the national economy cannot be met. For example, 1973 was a year of bumper harvests in cotton in our nation. The average per mu yield of cotton throughout the nation was only 69 jin, lower than the level of some major cotton producing nations of the world in that year (78 jin in the United States, 120 jin in the Soviet Union). The unit yields of cotton of various places throughout the nation were vastly different. Of the 16 key cotton producing provinces (cities, autonomous regions), the per mu yields of cotton of Jiangsu, Hubei and Shanghai in the southern cotton region were all above 100 jin while the per mu yields of the provinces of Shandong, Hebei and Shanxi which had more areas of cotton fields in the northern cotton region were only about 50 jin. Some provinces produced less than 40 jin (Figure 5-1). In 1973, most of the nation's concentrated cotton producing regions had a per mu yield of only 60 to 70 jin while high yielding regions such as Nantong in Jiangsu reached 119 jin. The yields of Yancheng in Jiangsu, Jingzhou, Huanggang and Xiaogan regions in Hubei reached above 95 jin. Typical bumper harvests, whether in the northern or southern cotton regions, emerged in great numbers. Of these, Nanhui County produced a per mu yield of 166 jin, Xinxiang County produced a per mu yield of 140 jin, and there were many commune brigades that produced a per mu yield of over 200 jin. It can be seen that working on unit yield in a big way to change low yields into high yields and high yields into higher yields is the major direction to increase cotton production. According to analysis of information, there were still 12 other provinces (cities, autonomous regions) in 1973 that did not reach the highest level of the past of the localities. If the per mu yields of all 16 key cotton producing provinces (cities, autonomous regions) of the nation reach the "guideline" (100 jin for the south, 80 for the north), then the total yield of cotton will reach above 60 million dan, thus it can be seen that our nation's potential for increasing the yield of cotton is great.

The regions suitable for cotton in our nation are broad. After Liberation, the area of cotton fields reached a high of 93.8 million mu. At present, there is still a definite potential for expanding the area of cotton fields. While emphasizing increases in unit yield, consideration can be given to appropriately develop cotton fields in the Hubei and Nanjiang regions where there are more cultivated land and the conditions for planting cotton are superior.

1. Correctly Handle the Relationship Between Food Grains and Cotton

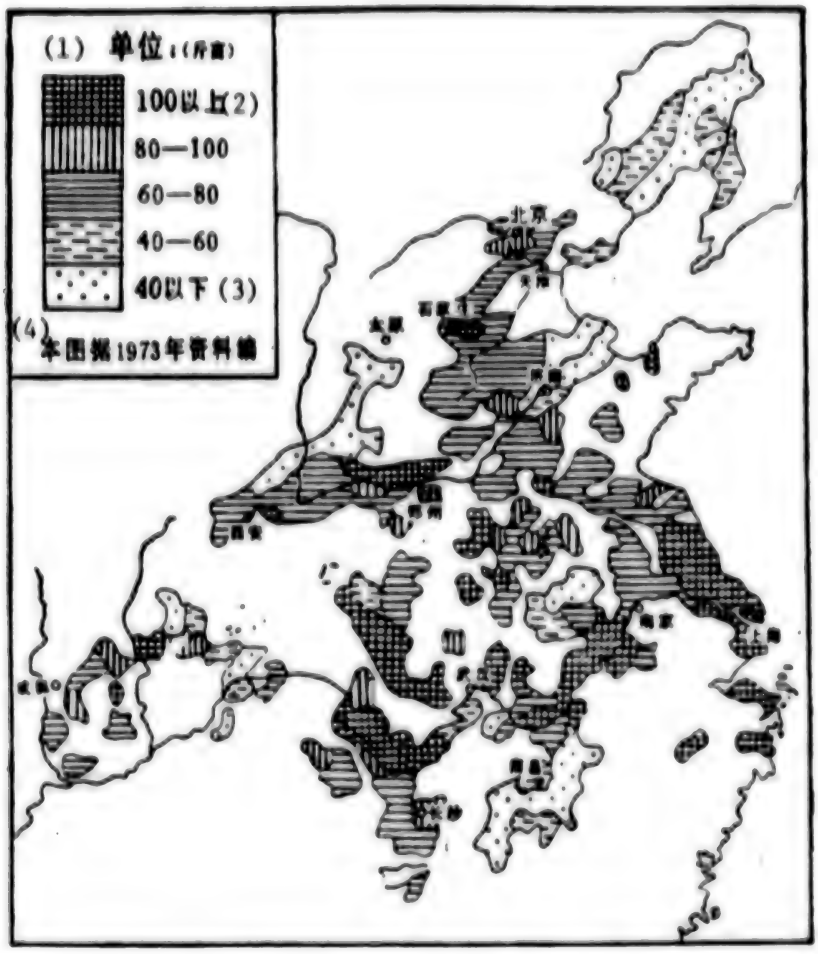


Figure 5.1 Distribution of the Per Mu Yields of the Concentrated Cotton Producing Regions of Eastern China

Key:
(1) Unit (jin/mu)
(2) Above
(3) Below
(4) This map was drawn from data for 1973

2. Rational Distribution, Appropriate Concentration

Appropriately concentrating the scattered cotton fields to build a group of cotton producing bases is a strategic measure to develop cotton production.

After Liberation, the distribution of our nation's cotton production underwent great change. First, the concentrated cotton producing regions moved from the coastal regions inland such as Xinjiang, Gansu, Sichuan, Hunan provinces (regions). They all expanded or developed new cotton regions in a bigger way, building new cotton bases and satisfying the need for industrial raw materials locally, and at the same time, strengthened and beefed up the old cotton bases. The historical situation of unilateral development and the irrational situation of lopsided concentration were changed and these production bases were able to better develop forward. For example, the proportion of cotton fields in the old cotton regions that were highly concentrated in the past gradually reduced and "overall development" was better implemented. At present, except for individual counties in the nation (such as Cixi in Zhejiang) which have over 70 percent of cotton fields, the proportion of cotton fields in most of the cotton producing counties is below 50 percent, beneficial to the rational distribution of food crops and cotton. In 1977, there were a total of 260 counties in the nation with over 100,000 mu of cotton fields, the area of these cotton fields constituted nearly 70 percent of the national total. Of these, there were 79 counties that had over 200,000 mu of cotton fields. All have realized this requirement.

Rational distribution of cotton fields and appropriate concentration are very beneficial to production. Bumper yields and more harvests, more contribution and large scale increases in the percentage of commercial cotton products can be realized. But at present, the nation still has about 10 million mu of scattered cotton fields distributed in over 700 counties. Because they are overly scattered, management of cotton fields is not refined, unit yield is very low, there is a lot of private cotton and the percentage of commercial products is low. For example, in 1977, Hebei Province had 51 counties with a total of 1.21 million mu. Each mu provided only an average of 12.2 jin of commercial cotton and the percentage of commercial products was 72 percent. The 2 provinces of Jiangsu and Hubei that had more concentrated cotton fields provided an average of 90 to 100 jin of commercial cotton per mu, the percentage of commercial products reached 98 percent. Thus, the scattered cotton fields should be rapidly concentrated at counties where conditions for planting cotton are good. Relatively concentrated cotton regions can be rationally arranged according to the present level of food grain production and the degree of self-supply to benefit hastening the progress of construction and promote better development of cotton production.

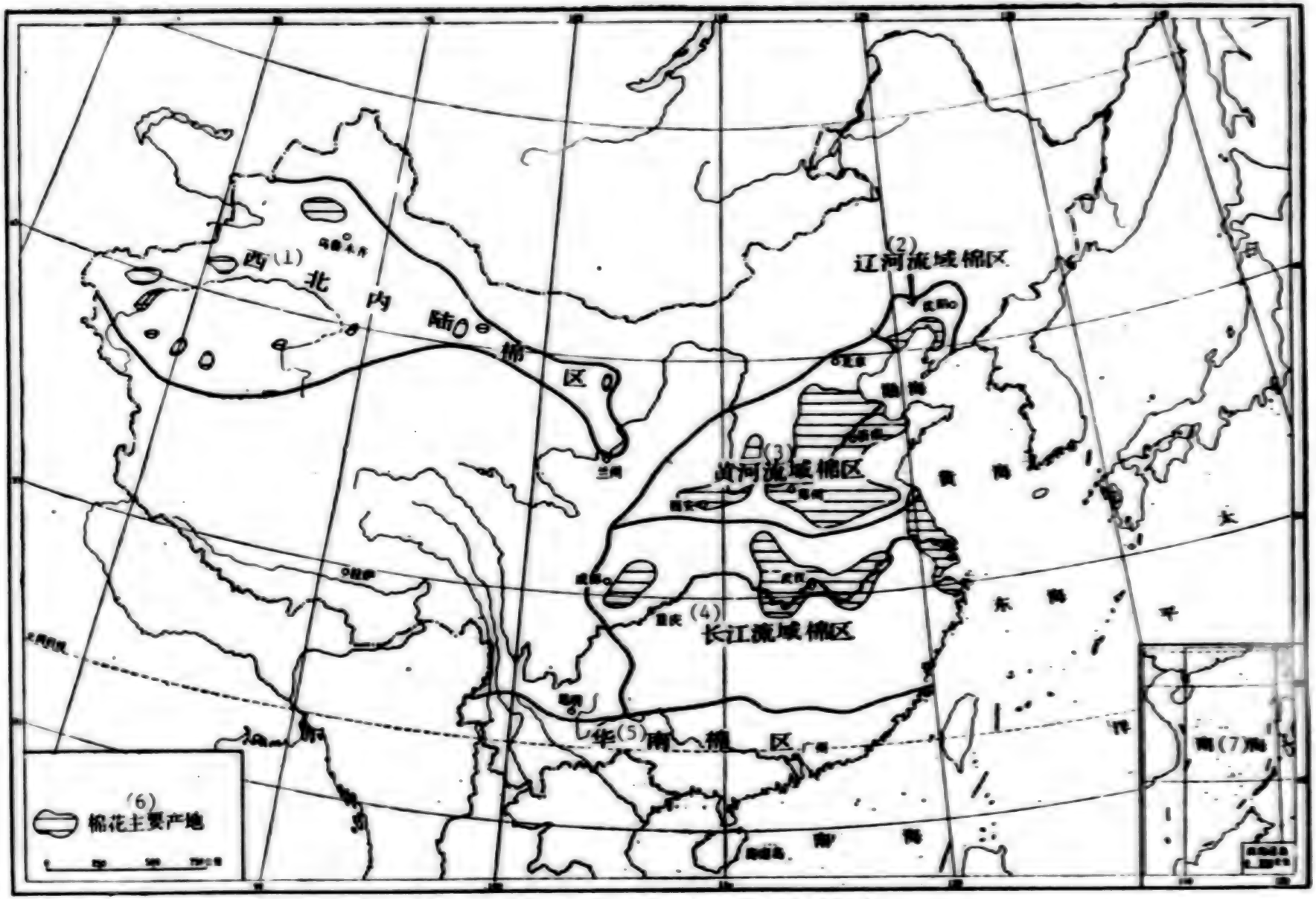


Figure 5-2 Distribution of Major Cotton Producing Regions in the Nation

Key: (1) Northwest inland cotton region
(2) Liaohe River Valley cotton region
(3) Yellow River Valley cotton region
(4) Changjiang River Valley cotton region
(5) South China cotton region
(6) Major cotton producing regions
(7) South Sea

[pp 206-208] [Text] Table 5-4 Basic Situation of Cotton Bases Throughout the Nation

(1) 棉区名称	(2) 范围	(7) 土壤条件	(12) ≥10℃积温	(13) [illegible] (天)	(14) [illegible] (毫米)	(15) [illegible]	(16) 棉花单产 (斤/亩)	(17) [illegible] (%)	(18) [illegible] (%)	(19) [illegible] (%)	(20) [illegible] (%)	(21) [illegible] (斤/亩)	(23) [illegible]
(a) (一) 长江三角洲	(3) [illegible] 32个县	[illegible] (8)	4,400–5,600	225–250	900–1,500	11.6	109.3	158.4	18.4	90 95	15–40 (21)	800–1,500	[illegible] (24)
(b) (二) 江汉平原	(4) [illegible]	(9) [illegible]	5,000–5,500	225–260	1,000–1,400	9.5	114.9	166.5	15.9	80–98	20–40		[illegible] (25)
(c) (三) [illegible]	(5) [illegible] 共20个县市	(10) [illegible]	5,500–5,600	225–260	1,200–1,600	2.6	73	106	2.1	91	10–20	500–1,000	[illegible] (26)
(d) (四) [illegible]	(6) [illegible] 共19个县	(11) [illegible]	5,000–5,300	250–275	1,300–1,400	2.4	66.1	96.0	2.3	60–95	10–15	700–900	[illegible] (27)

[table continued]

Table 5-4 [continued]

(五) [illegible] (e)	包括江西的九江、抚州地区共20个县 (28)	属于[illegible]江[illegible]冲积平原，砂[illegible]土，[illegible]肥沃，水利条件较好 (33)	5,500—5,600	250—275	1,200—1,600	1.9	40.9	59.3	1.1	75—95	5—30 (最高60) (38)	550—700	肥料不足，[illegible]产量，为长江[illegible]的低产棉区。要大力发展有机肥料和棉田冬季绿肥，进一步搞好农田水利建设 (42)
(六) 四川盆地 (f)	包括四川的内江、南充、绵阳、乐山、[illegible]江等地区50多个县 (29)	棉田主要分布在四川盆地内河流两岸冲积平原和丘陵地带，海拔多在200—500米，土壤多为肥沃的紫色土和砂壤土 (34)	4,500—5,700	275—325	900—1,300	5.5	74.0	107.3	6.0	85—95	5—25	500—1,000	分散棉田面积大，棉田[illegible]分散。调整布局，适当集中，减少不合理间套，发展[illegible]，解决用地养地问题 (43)
(七) 冀中南地区 (g)	包括河北的保定、石家庄、邢台和邯郸等地区共计35个县市 (30)	属于太行山以东冲积平原，坡度1/600左右，地下水源丰富，土壤多为砂壤土、[illegible] (35)	4,000—4,500	180—200	500—700	6	53	77.2	5.0	94	(39) (最高36)	[illegible]—900	棉花布局过于分散，棉田不合理间套十分普遍，缺乏肥料，棉花产量低而不稳。要调整布局，巩固发展老集中产棉区，发展以棉花为中心的轮作制度，改变不合理间套 (44)
(八) 豫西北地区 (h)	包括河南的新乡、[illegible]、[illegible]等地区共22个县 (31)	属于山麓冲积扇和黄河冲积平原，土壤肥沃，地下水丰富，有部分丘陵棉田 (36)	4,200—4,700	190—210	550—750	3	80	116.6	3.7	91	16 (最高27) (40)	400—800	[illegible]等地区棉田面积分散，棉田[illegible]较普遍。加强[illegible]建设，把西部分散棉区适当集中起来，减少不合理间套 (45)
(九) 鲁西北地区 (i)	包括山东的德州、聊城、惠民等地区19个县市 (32)	属河[illegible]下游[illegible]冲积平原，海拔50米以下，[illegible]起伏，土壤[illegible]碱性 (37)	4,200—4,700	190—210	550—800	8	49	71.4	6.5	94	15 (最高30) (41)	300—400	[illegible]棉田占20%以上，是全国[illegible]低产棉区之一，棉花单产不及全国平均单产的1/2。需进行以抗旱、[illegible]、改碱为中心的棉田基本建设 (46)

[table continued]

Table 5-4 [continued]

棉区名称 (1)	范围 (2)	土地条件 (7)	≥10°C 积温 (12)	无霜期 (天) (13)	年降水量 (毫米) (14)	棉花面积占全国% (15)	棉花单产 (斤/亩) (16)	为全国平均单产的 (%) (17)	棉花总产占全国 (%) (18)	棉花商品率 (%) (19)	棉田占耕地 (%) (20)	粮食亩产 (斤/亩) (21)	主要问题和增产措施 (23)
(十) (j) 关中地区	包括陕西的渭南、咸阳和宝鸡等地区的24个县市 (47)	[illegible] (52)	4,000–4,600	190–210	540–750	5.4	51.0	74.3	4.7	96	20 (最高31) (57)	220–500	[illegible] (61)
(十一) (k) 晋南地区	包括山西的运城等地区的14个县市 (48)	[illegible] 150–500 米 [illegible] (53)	3,900–4,400	160–210	500–600	3.0	59.0	86.0	2.5	90	20 (最高28) (58)	310–500	干旱、干热风和盐碱等 [illegible] (62)
(十二) (49) (l) 淮北地区	包括江苏的徐州、淮阴，安徽的宿县、阜阳，河南的商丘、周口、开封、许昌、驻马店等地区102个县	[illegible] (54)	4,000–4,800	200–225	500–800	5.0	59.3	86.2	4.4	90	10 (最高17) (59)	500–700	[illegible] (63)
(十三) (50) (m) 南疆地区	包括新疆的阿克苏、喀什、和田、巴音郭楞等地区10多个县	[illegible] (55)	4,000–5,500	150–200	50–60	3.1	59.0	86.0	2.6	90	15 (最高23) (60)	150–250	[illegible] (64)
(十四) (51) (n) 辽西地区	包括辽宁的朝阳地区和锦州市共十几个县	[illegible] (56)	3,400–3,550	150–175	500–700	1.5	38.4	55.7	0.84	80–90	5–15	200–500	[illegible] (65)

(66) 注：棉花面积和产量系1973年数字

[see next page for key to Table]

Key to Table 5-4

(1) Name of cotton regions

(a) Changjiang Delta
(b) Jianghan Plain
(c) Anhui Yanjiang Plain
(d) Dongtinhu Plain
(e) Boyanghu Plain
(f) Sichuan Basin
(g) Central and Southern Hebei
(h) Northwestern Henan
(i) Northwestern Shandong
(j) Central Shaanxi
(k) Southern Shanxi
(l) Huibei region
(m) Southern Xinjiang
(n) Western Liaoning

(2) Scope
(3) Including all of the regions of Nantong and Yancheng in Jiangsu, some counties of the Suzhou and Yangzhou regions, Shanghai City, northern Zhejiang, totaling 32 counties.

(4) Including the Jinzhou region, some counties of Xiaogan, Huanggang, Xiangyang, Yichang, Xianning areas in Hubei, and Wuhan, totaling 31 counties and city.

(5) Including Hefei City, Liuan, Anqing and Wuhu areas in Anhui, totaling 20 counties and city.
(6) Including Changde, some counties of the Yiyang and Yueyang regions totaling 19 counties.
(7) Conditions of land

(8) Mainly the alluvial plain of the Changjiang Delta, generally at an elevation of below 50 meters above sea level. Along the river is alluvial soil without lime. Along the coast the soil is salinized soil.

(9) Mainly belonging to the alluvial plains of the Changjiang and Hanshui, mostly fertile sandy loam, part of the area is hills and mounds. It can also be divided into three types of regions, the lake region, plains and hilly region.

(10) Belonging to the alluvial plains along rivers and lakes and hilly regions. Elevation is mostly between 50 and 200 meters above sea level. The soil is sandy loam and clay loam.

(11) Belonging to the alluvial plains banking lakes. The soil is fertile sandy loam, parts belong to the hilly region. Generally, water conservancy conditions are good.

(12) Cumulative temperature ⩾10°C
(13) Frostless period and period without freezing (day)
(14) Annual rainfall (millimeter)
(15) Area of cotton as a percentage of the national total (percent)
(16) Unit yield of cotton (jin/mu)
(17) Percentage of the national average unit yield (percent)
(18) Total yield of cotton as a percentage of the national total (percent)
(19) Percentage of commercial cotton (percent)

[key continued]

[continuation of key to Table 5-4]

(20) Cotton fields as a percentage of cultivated land (percent)
(21) (Highest 70)
(22) Per mu yield of food grains (jin/mu)
(23) Major problems and measures to increase production

(24) In the development of cotton and the triple cropping system, the conflict between paddy and dryland crops is more outstanding. In spring, the temperatures are low and the weather is overcast and rainy and there is damage due to waterlogging, unfavorable to early development of cotton. Mechanization of the planting of cotton must be quickly realized and companion planting of winter and green manure in cotton fields must be popularized. In the basic construction of cotton fields, building a sound drainage and irrigation system must be emphasized.

(25) Flooding and drought frequently occur and flooding and waterlogging are especially serious. The percentage of cotton fields easily waterlogged is 36 percent. Basic construction of cotton fields must be further carried out well, drainage and irrigation system must be perfected, the land must be leveled and prepared in a big way, the wide and narrow row method and the "three groups and six rows" method of planting must be popularized in planting the cotton fields.

(26) The cotton fields on islets in the rivers are easily damaged. The soil of the cotton fields in the hilly regions is infertile. The distribution of cotton fields is generally scattered. Water conservancy construction to prevent floods and to drain waterlogged conditions must be done well. Companion planting of green manure in cotton fields must be popularized, rotation planting of cotton-rape must be developed.

(27) Most of the cotton fields are uneven, one-third of the cotton fields is easily threatened by drought and waterlogging, fertilizers are lacking, 40 percent of the low yielding cotton fields need to have deep trenches and large ditches so that drainage and irrigation can be separated, the soil must be improved, winter and summer planting of green manure in cotton fields must be popularized to use and nurture the land.

(28) Including Jiujiang and the Fuzhou area in Kiangxi totaling 20 counties.
(29) Including Neijiang, Nanchong, Mianyang, Leshan, Wenjiang areas in Sichuan totaling over 50 counties.
(30) Including Baoding, Shijiazhuang, Xingtai and Handan areas in Hebei totaling 35 counties and cities.
(31) Including Xinxiang, Anyang, Luoyang areas in Henan totaling 22 counties.
(32) Including Dezhou, Liaocheng, Huimin areas in Shandong totaling 39 counties and cities.
(33) Belonging to the alluvial plain along rivers and lakes, sandy loam, relatively fertile, water conservancy conditions are better.
(34) The cotton fields are distributed mainly inside the Sichuan Basin along the 2 banks of rivers in the alluvial plains and hilly regions, the elevation is mostly 200 to 500 meters above sea level, the soil is mostly fertile purplish soil and sandy loam.

[key continued]

[continuation of key to Table 5-4]

(35) Belonging to the alluvial plain east of Tainhangshan, the slope is 1/600, underground water sources are rich, the soil is slightly alkaline sandy loam.
(36) Belonging to the alluvial fan of the foothills and the alluvial plain of the Yellow River, the soil is fertile, underground water is rich. There are some hilly cotton fields.
(37) Belonging to the coastal alluvial plains of the lower reaches of rivers, the elevation is below 50 meters above sea level and the land has a wavy topography, the soil is alkaline.
(38) (Highest 60)
(39) (Highest 36)
(40) (Highest 27)
(41) (Highest 30)
(42) Fertilizers are deficient, flooding and waterlogging are serious. It is the low yielding cotton region of the Changjiang River Valley. Organic fertilizers and winter and summer planting of green manure in cotton fields must be developed in a big way, farmland water conservancy construction must be further done well.

(43) The area of scattered cotton fields is large, interplanting and companion planting of food grain crops in cotton fields are very common. The distribution must be adjusted to appropriately concentrate the fields and irrational interplanting and companion planting must be reduced, planting of green manure in cotton fields must be developed to solve the problem of using and nurturing land.
(44) The distribution of cotton tends to be scattered. Irrational interplanting and companion planting in cotton fields are very common, fertilizers are lacking, the yields of cotton are low and unstable. The distribution needs to be adjusted, the old centralized regions that produce cotton must be beefed up and developed. Rotation of reverse cropping centered around cotton must be developed and the irrational interplanting and companion planting must be changed.
(45) The area of cotton fields in the regions of the west and Luoyang is scattered, companion planting of food grain crops in cotton fields is relatively common. The construction of the old cotton regions in northern Henan must be strengthened. The scattered cotton regions in the western part should be appropriately centralized. Irrational interplanting and companion planting must be reduced.
(46) Waterlogged, lowland, saline and alkaline cotton fields constitute over 20 percent. The area suffers from many disasters and is one of the nation's low yielding cotton regions. Unit yield of cotton is less than one-half the average national yield. Basic construction of cotton fields centered around measures to resist drought, control waterlogging and change alkalinity must be carried out.

(47) Including Weinan, Xianyang and Baoji areas on Shaanxi totaling 24 counties and cities.
(48) Including Linfen and Yuncheng areas in Shanxi totaling 14 counties and cities.

[key continued]

[continuation of key to Table 5-4]

(49) Including Xuzhou, Huiying in Jiangsu; Suxian, Fuyang in Anhui; Shanqui, Zhoukou, Kaifeng, Xuchang, Zhumadian in Henan totaling 102 counties.
(50) Including Aksu Prefecture, Kashgar Prefecture, Khotan Prefecture, Turfan Prefecture in Xinjiang totaling over 10 prefectures.
(51) Including the Zhaoyang area and Jinzhou City in Liaoning totaling over 10 counties.
(52) Belonging to the alluvial plain of Wei River, terrace land of rivers and loess highlands. The elevation is between 360 and 700 meters above sea level, the land is level, the soil is fertile, the water conservancy conditions in the plains are better.
(53) Belonging to the valley plains of Fen River and terrace land of rivers, the elevation is between 350 and 500 meters above sea level, the land is level, the soil is fertile.
(54) Belonging to the alluvial plains of the Yellow and Hui Rivers. The land is expansive and level, the soil is fertile, mostly sandy loan and slightly alkaline.
(55) Belonging to the Tarim Basin, the surrounding "fertile oases" have good light, heat and soil conditions and there are underground water sources.
(56) Mainly the alluvial plain of Daling River, partly hilly mountain land.
(57) (Highest 34)
(58) (Highest 28)
(59) (Highest 17)
(60) (Highest 23)
(61) Most of the cotton fields are level if they are expansive but not level if they are small. Summer drought and spring low temperatures are more serious. The cotton fields in the original region lack water, the yield of cotton is low and unstable. Basic construction of cotton fields mainly in leveling and preparing the land, deep upturning and improving the soil needs to be grasped well. Rotation planting of cotton and rape should be popularized.
(62) Disasters due to drought, dry hot winds and saline and alkaline damage are more serious. The yield is unstable. Deep upturning, improving the soil and controlling alkalinity, developing underground water sources and planting protective forests for the cotton fields must be done well.
(63) The cotton fields are relatively scattered and they are threatened by drought, waterlogging, alkalinity. The history of planting cotton is relatively short. Cotton is being developed and the proportion of cotton fields can be continuously increased. Basic construction of cotton fields centered around resisting drought, controlling waterlogging and improving alkalinity should be done well.
(64) The cotton fields lack water, the relatively low yield of food grains of this region is the main problem affecting the development of cotton in this area. The development of underground water sources must be strengthened, irrigation of cotton fields must be developed, food grain supply in cotton regions must be assured to make the region the base of our nation's long staple cotton.

[key continued]

(65) The growth period of cotton is relatively short, missing seedlings is serious. Especially during the latter growth period, temperatures drop rapidly, many flowers emerge after frost. The key is to cultivate early maturing varieties that are resistant to cold and that produce a high yield.

(66) Remark: Areas and yields of cotton are figures for 1973.

[pp 209-221] [Excerpts]

Section 3 Oil Bearing Crops

1. General Situation of the Development of the Production of Oil Bearing Crops in Our Nation

Table 5-5

Item \ Year	1952	1957	1962	1972	1978
Total of oil bearing crops (10,000 mu)	8,571.0	10,398.4	6,230.1	7,944.9	9,333.3
Including: Peanuts (percent)	31.6	36.6	31.3	35.5	28.4
Rape	32.6	33.3	32.8	37.1	41.8
Sesame	18.5	13.6	17.3	11.3	10.2
Linseed	8.9	9.2	10.1	9.2	9.2
Other oil bearing crops	8.4	7.3	8.5	6.9	10.4

2. Development and Distribution of the Production of Major Oil Bearing Crops

(1) Peanuts

Among the various kinds of oil bearing crops in our nation, peanut leads all others in importance. In 1978, the sowing area of peanuts constituted 28.4 percent of the area of all oil bearing crops of the nation, slightly less than that of rapeseed, but the total yield constituted 45.6 percent of the total oil bearing crops of the nation. The average per mu yield is 179 jin, the highest average per mu yield of all oil bearing crops.

For more than 20 years, the production of peanuts has undergone great changes. From 1953 to 1957, the sowing area of peanuts averaged 33.79 million mu, the total yield averaged 54.91 million dan. In 1956, the record high in yield was reached: the planting area was 38.73 million mu, total yield was 66.72 million dan. These dropped drastically during the 3 years of temporary difficulties. In the lowest year, the sowing area was only 18 million mu (1961), total yield

was only 16.09 million dan (1960), the average per mu yield was only 80 jin (1960). Later these gradually rose again. Between 1964 and 1978, the sowing area of peanuts remained between 26 million and 28 million mu, the average per mu yield fluctuated between 140 and 180 jin, total yield fluctuated between 38 million and 48 million dan, still not up to the highest record of the past.

Our nation's regions of peanut production are distributed widely. They extend to the Songnen Plain in the north, south to Hainan Island, west to the Tarim Basin, and except Xizang, Qinghai, Ningxia and Nei Monggol, peanuts are produced in all other provinces and cities and autonomous regions of the nation. But the major production region is distributed in the east, south of Liaoning in the warm temperate zone, subtropical zone and the tropical zone. The 10 provinces and regions of Shandong, Guangdong, Guangxi, Hebei, Liaoning, Anhui, Sichuan, Fujian, Jiangsu and Henan are our nation's major peanut production areas. The 10 provinces and regions encompass 90 percent of the area of peanut plantations and produce the same percentage in yield of the nation. The first 5 provinces and regions encompass 70 percent of the area and produce the same percentage of peanuts of the nation. They constitute the major centralized region of peanut production of the nation, and Shandong leads the nation. Its yield of peanuts is over one-third that of the nation.

Our nation's peanut production regions can be divided into the centralized production region, general production region and scattered production region.

The characteristics of the centralized peanut production regions are: the planting areas of peanuts are large, there are many counties engaged in centralized production, peanut occupies an important position among the local agricultural crops, the leadership and the masses generally place more emphasis on peanut production, the experience of production is rich, the level of unit yield is generally higher, the percentage of commercial products is also higher, and they are the major commercial bases and export bases of peanuts. There are two major centralized production regions of peanuts throughout the nation:

One is the Shandong Peninsula, Liaodong Peninsula, the Liaoxi Corridor, the lower reaches of Luan River in eastern Hebei, the hilly regions surrounding Bohai and sandy land along rivers, including Yantai, Liyi, Changtan, Taian and Jining areas in Shandong, Lushun-Dalian cities and Jizhou City in Liaoning, Tangshan area in Hebei and Donghai and Ganyu counties of Jiangsu Province closely connected to the southern hilly regions of southern Shandong. According to county statistics of 1971, the planting area of peanuts constituted 38 percent of that of the nation and the total yield constituted 49 percent. It is our nation's largest peanut production base and export base. The nation's major counties engaged in centralized peanut production are distributed in this region. For example, in 1971, there were 22 counties with over 200,000 mu of peanut plantations (the nation had a total of 23 counties), there were 13 counties with 100,000 to 200,000 mu of peanut plantations (the nation had a total of 37), there were 13 counties with 50,000 to 100,000 mu of peanut plantations (the nation had a total of 76). In most of the centralized counties, the peanut plantations constitute from 10 to 20 percent of the total sowing area of agricultural crops. In some counties, peanut plantations constitute over 20 percent

of the total sowing area (such as Qixia, Penglai, Xinjin, Jinxian, Luanxian). The unit yield of peanuts of hilly regions of Jiaodong is the highest. Most of the counties produce a per mu yield of over 300 jin of peanuts in ordinary years, surpassing the national average per mu yield by onefold. Some high yielding commune brigades have reached over 400 jin. The yield of the south central hilly regions of Shandong is the second highest, followed by eastern Hebei and southern Liaoning. In the past, the main peanut variety was the late maturing variety (with a growth period of about 160 days), sown in spring and rotated with sweet potato and corn, of one cropping a year. In recent years, to increase the yield of food grains and increase the multiple planting index, the planting of peanuts has been decreased, the early maturing variety of summer peanuts (with a growth period of 125 to 130 days) was expanded and planted in companion with wheat of double cropping a year or triple cropping in 2 years. The major problems concerning the further increase in production are: 1) Basic farmland construction of the peanut plantations is backward, most are "three running fields," the ability to resist disasters is weak, loss of water and soil is serious, there is little irrigated land, the periods of germination and peg forming are frequently threatened by drought. Farmland basic construction must be greatly strengthened, low yielding fields must be reformed, spray irrigation must be developed in hilly regions, the ability to resist disaster must be improved; 2) Some of the commune brigades have an overly high ratio of peanut plantations, some of the commune brigades in Jiaodong and Liaodong Peninsula have peanut plantations that constitute 40, 50 and even over 60 percent of the area of cultivated land, reverse cropping is difficult, and insect pests, especially nematode disease, are serious. According to local experiences, to avoid recropping year after year, the peanut plantations should not constitute over 30 percent of cultivated land. Overly high ratios should be appropriately adjusted.

The second is the hilly and coastal regions of Fujian, Guangdong, Guangxi and Taiwan in southern China. In Fujian Province, peanut plantations are mainly distributed in Jinjiang, Putian and Longxi areas on the southeastern coast of Fujian east of Daiyunshan and south of Fuzhou. In Guangdong Province, peanut plantations are widely distributed but are highly concentrated in the Zhanjiang area followed by Huiyang, Shantou, Shaoguan, Foshan and Hainan Island. In Guangxi Province, peanut plantations are mainly found in Nanning, Liuzhou, Yulin, Qinzhou areas. As the area of peanut plantations expanded in recent years, the area of distribution also expanded. In 1975, the areas of peanut plantations in the 3 provinces constituted 31.7 percent of the national total, the total yield constituted 27.6 percent of the national total, and they are our nation's second largest concentrated peanut producing region. The concentration of peanut production is not as high as the first region, but there are also many concentrated peanut producing counties. According to county statistics of 1971, there were 16 counties with 100,000 to 200,000 mu of peanut plantations, and 42 counties with 50,000 to 100,000 mu of peanut plantations. The peanut plantations of the concentrated peanut producing counties can constitute 5 to 10 percent of the total sowing area of agricultural crops. A few counties' peanut plantations surpass 10 percent of the total. Peanut plantations are mainly distributed in the red and yellow earth soils of the hilly regions, and peanuts are frequently used as the vanguard crop to claim red earth. Peanuts are cultivated in spring and autumn. Most are spring peanuts. Autumn peanuts are mostly left as seeds for spring sowing. This makes it easy to produce full and strong seedlings.

Because 70 to 80 percent of the peanut plantations are distributed in the infertile arid slopeland, water conservancy facilities are poor, therefore the seedling period and the flowering and peg forming periods of peanuts frequently are threatened by drought conditions, the percentage of wilting disease of peanuts is high, planting and management are not refined, therefore generally the unit yield of peanuts is not high, only 100 to 120 jin, but some high yielding counties can produce over 200 jin (per mu). Some peanuts are planted in paddy fields and can be irrigated for paddy and dryland crop rotation. In this way, the threat of drought is lessened and the percentage of wilting disease is small. In ordinary years, per mu yield can reach 200 to 300 jin. Therefore, the expansive hilly regions must strengthen basic farmland construction, the dryland must be leveled and prepared to solve the problem of "the three runs," the soil must be plowed deeply and the soil must be improved, the application of organic and phosphorous fertilizers should be increased, superior varieties must be used and the seeds of the early season crop should be replanted in autumn to greatly increase the unit yield of peanuts.

The general production regions of peanuts mainly include south central Hebei, eastern Henan and northern Henan and northwestern Shandong in the plains of the Yellow River, Hui River and Hai River, provinces and regions of the middle and lower reaches of the Changjiang such as northern Jiangsu, central Anhui, southern Jiangxi, eastern Hubei and southern Hunan, hilly regions of central Jiangxi, eastern Hubei and southern Hunan, hilly regions of central Sichuan in the Sichuan Basin, southern Yunnan and northeastern Guizhou. Some are distributed in the alluvial sandy land along the banks of large rivers, but most are distributed in the hilly slopeland. In the past, many provinces and regions were major peanut production regions of the nation. In recent years, the areas of peanuts have been greatly reduced. Although peanuts are still widely distributed, but most are distributed in scattered counties. Except for the few concentrated counties with larger peanut plantations and a higher commercial products percentage, the ordinary counties have small areas of peanut plantations, the commercial products percentage is not high, and peanuts do not play an important role in the local production of oil bearing crops, and the unit yield of peanuts is also relatively low.

The scattered peanut production regions are mainly the Weinan region of Shaanxi, Yuncheng region of Shanxi, Turfan Basin and the few counties at the southern and northern foothills of Tianshan in Xinjiang, central Jilin Province, and the central part of the Nenjiang Plain of Heilongjiang. The areas of peanut plantations are not large, the distribution is not wide, the commercial products percentage is very low. Some regions such as the Central Shanxi Basin in Shanxi and the Songnen Plain have in recent years expanded the planting of peanuts.

(2) Rapeseed

Rapeseed is the oil bearing crop that covers the largest sowing area and is distributed most widely in our nation. In 1978, the sowing area of rape throughout the nation constituted 41.8 percent of the total area of oil bearing crops. The yield of rapeseed constituted 35.8 percent of the total yield of oil bearing crops throughout the nation. Among the major oil bearing crops, rape possesses several outstanding qualities.

Table 5-6 Ratio of the Sowing Area of Rape in the Major Rape Producing Regions of the Nation

Major rape producing regions	Sowing area of rape in 1975 (10,000 mu)	Percentage of the national total
National statistics	3,469.7	100
Winter rape producing regions	2,983.2	86.0
Northern winter rape producing regions	321.4	9.0
Regions of the middle and lower reaches of the Changjiang	1,578.2	45.5
The southwestern regions	913.6	26.5
South China regions	170.0	5.0
Spring rape producing regions	486.5	14.0
Cold regions of the Qinghai-Xizang Plateau	82.5	2.4
Arid regions of the northwest	116.9	3.4
Nei Monggol and the northern part of the loess plateau	116.5	3.4
Northeastern regions	170.6	4.8

(3) Sesame

Sesame is the oil bearing crop that has decreased the most after Liberation. During the first 5-year plan, the area of planting of sesame was the largest, averaging over 15 million mu. Later, the area shrank. In 1975, the area of planting of sesame throughout the nation was only 46.6 percent (44.9 percent in Henan, 39.3 percent in Hubei, 27.1 percent in Anhui) of the largest area after Liberation (1955) and the smallest since Liberation. In 1975, total yield of sesame was only 40 percent of the highest yielding year after Liberation (1953). In all major oil bearing crops, it was even lower than the yield of linseed.

The per mu yield of large area planting of sesame has been low and unstable for a long period. The average national per mu yield of sesame during the 27 years from 1949 to 1975 was only 50.5 jin, and in the highest year (1971) it was only 63 jin, and the lowest was less than 30 jin (29 jin in 1954, 26 jin in 1960). The major producing region is Hubei with a higher per mu yield, higher by 50 percent than Henan, but the average over many years was only 66.8 jin, the highest (1971) reaching only 85 jin. The major producing regions of Henan, Anhui and Jiangxi all produced low yields of an average over many years of less than 50 jin, the lowest was less than 30 jin.

(4) Linseed

The planting area of linseed (oil producing flax and dual use flax) throughout the nation has fluctuated between 7 million and 10 million mu. In the latter period of the 1950s, this reached 10 million mu, but after 1960, this visibly decreased. In 1978, it was only 9.564 million mu, widely distributed in the northern part of north China and in the provinces and regions of the northwest. Linseed is the main edible oil bearing crop of the locality.

Our nation's linseed is mainly distributed in the regions from the upper reaches of the Luan River in Hebei Province extending westward along both sides of the Great Wall to the two sides of Liupanshan. This region extending from the northeast to the southwest includes the Bashang area in Hubei, southern Nei Monggol, northwestern Shanxi, the northernmost area of Shaanxi, southern Ningxia, central and eastern Gansu and Huangshui River Valley in eastern Qinghai. The area constitutes over two-thirds of the total area of linseed fields throughout the nation. In this region there are two concentrated linseed producing regions: one is the Bashang region in Hubei, southeastern Nei Monggol, Yanbei region and the northwestern part of Xinxian in Shanxi. Linseed is one of the four major crops of the locality (naked oat, spring wheat, potato and linseed). In most counties, the area of linseed constitutes 5 to 10 percent of the total sowing area of agricultural crops. In many counties, it constitutes over 10 percent. In Guyuan and Pinglu, it covers 18 percent. The second is the region on the two sides of Liupanshan, mostly concentrated in Xiji, Guyuan, Huining, Dingxi and Tongwei counties. The area of linseed also constitutes about 5 to 10 percent of the total sowing area of agricultural crops. The counties near and surrounding these two concentrated regions are the scattered linseed producing regions.

The other major region of linseed is on the fertile islets and irrigated farming areas of the northwest under arid climate, including the Houtao Plain, the area irrigated by water of the Yellow River in Ningxia, Hexi Corridor in Gansu, the counties at the southern and northern foothills of Tianshan in Xinjiang (especially Yining and Baicheng counties). Linseed is mostly scattered in each commune brigade and almost every commune and brigade plants linseed.

The main problem in linseed production is a very low unit yield. In 1978, the national average per mu yield was only 53 jin. Since the founding of the nation, the highest per mu yield was only 67 jin (in 1956), the lowest was only 21 jin (in 1960), between 1952 and 1959, which was the period with a relatively high per mu yield, the average was only 56.6 jin.

(5) Sunflower

The growth period of sunflower is short. Sunflower is tolerant to drought, infertile conditions, alkalinity and salinity. It is strongly resistant to disease and insect pests and it is highly adaptable. Saline, alkaline and infertile land can be used to plant sunflower. It does not compete with food grain crops, and it is extremely suitable for planting widely in regions with a lot of land and few people in north China, the northeast and the northwest.

Our nation's southern and northern provinces and regions have produced sunflower for a long time. But except for the few provinces and regions in the northeast and north China that habitually plant sunflower in expanses, other regions mostly plant sunflower in a scattered manner, the commercial products percentage is not high, and most of the varieties of sunflower are edible varieties, and very few are used to press oil. In recent years, introduction of oil bearing sunflower into Liaoning, Jilin, Shanxi and Nei Monggol has been successful. Because oil bearing sunflower matures early (90 days from germination to maturity), the oil content is high (45 to 50 percent, higher than that of ordinary sunflower by 25 to 30 percent, onefold higher than that of soybeans), the height and maturation period of high yielding plants are uniform, it is easy to cultivate and manage and it can be harvested mechanically; it is therefore very popular. In recent years, the planting of sunflower throughout the nation has been very rapid. Jilin Province has the largest area of planting mostly concentrated in the Baicheng region, followed by Liaoning, Heilongjiang, Nei Monggol, Hebei, Shanxi, the coastal region of Shandong, Gansu, Xinjiang. All kinds of saline and alkaline land, windy and sandy land, arid and infertile land have been used en masse to plant sunflower. Many counties of concentrated production, especially the counties in the Baicheng area, have set up sunflower processing plants on a widespread basis, solving the problems of peeling and pressing sunflower. This has served importantly in solving the province's problem of edible oil. In the suburbs of Shenyang City, the multiple planting system of two crops of oil bearing crops of rape-sunflower a year has been successfully implemented in recent years (rape is sown on 10-15 March, harvested during the last 10 days of June, sunflower is sown at the end of June, harvested at the end of September). The multiple planting area developed from 200 mu in 1975 to 100,000 mu in 1976 and 160,000 mu in 1977. Per mu yield of repeated cropping of sunflower was all over 100 jin. According to surveys and studies, in the regions north of the Yellow River, especially in the northeast, the western part of north China, the northwest and the eastern coastal regions, the production of sunflower has a future for broad development. But in the southern regions of the northeast and the central regions of north China, especially in winter wheat multiple planting regions, the multiple planting system of rape-sunflower can be popularized by suiting measures to local circumstances.

(6) Other Oil Bearing Crops

Besides the five types of oil bearing crops mentioned above, there are "other oil bearing crops" that occupy about 5 percent of the total sowing area of oil bearing crops. Of these, castor seed, hemp seed and perilla are planted over larger areas, and they are mainly distributed in the northeast, north China and the northwest.

Castor is thermophilous and is not tolerant to frost and freezing. It is resistant to drought but not tolerant to waterlogging. It is strongly adaptable to soil. It can grow well in infertile land, rocky soil or weakly alkaline soil. It is widely planted in our nation's northern and southern provinces and regions, but mostly in the provinces of the northeast and north China. In recent years, castor has been planted in continuous expanses in Cherim League and the Baicheng region in Jilin, and the Suihua region of Heilongjiang. This is especially outstanding. The development of castor can provide oil for industrial use and export, but also can be a substitute for the massive amount of edible oil used

industrially. It can also fully utilize open spaces, wasteland, abandoned land, and it will not compete with food grain crops for land. It should be actively popularized.

Hemp seed is oil bearing hemp. It does not require a lot of heat, its young seedling is strongly tolerant to cold, it is suitable for planting in sandy loam with good drainage. It is mostly planted in eastern regions of the Songnen Plain in Heilongjiang (mainly the Suihua region and Nenjiang region), plains along the banks of Xiliao River in Jilin and the central plains of Jilin (mainly Cherim League and the Changchun region), followed by Liaoning, Shaanxi, Gansu and Hebei.

Perilla seed is the general name for the seeds of purple perilla (perilla) and common perilla (common perilla). It is chimonophilous and is mostly distributed in the northern regions of the temperate zone, mainly in Heilongjiang Province (Nenjiang region, especially in Nehe County), followed by Gansu and Jilin provinces.

In recent years, the newly introduced and popularized oil bearing crops are mainly cyperus erculentus and guizotia obyssinica.

Cyperus erculentus is a superior quality and high yielding oil bearing crop. In 1960, it was introduced from Bulgaria. It has been successfully introduced and planted in 22 provinces and regions of Guangdong, Guangxi, Hubei, Sichuan, Beijing, Gansu, Shandong, Shanxi, Liaoning, etc. Cyperus erculentus is suitable for planting in sandy loam, but not suitable in clay soil, and it can be planted on sandy river beaches. The seeds (tuber) of the plants of the south produce 28 percent and those of the north produce 18 percent oil. The oil cake contains a lot of starch and can be a food substitute. The highest per mu yield of test planting in small areas reached 1,000 jin, equivalent to nearly 200 jin of oil, far higher than other oil bearing crops. Harvesting of the tubers requires a lot of work (30 to 40 workers per mu), and it can only be widely popularized after the problem of mechanized harvesting is solved.

Guizotia obyssinica belongs to the helianthus, compositae. It originated in Ethiopia on the tropical East African Plateau. In recent years, it was introduced to southwestern Yunnan from Burma. Its growth period is short, it is strongly adaptable, but it does not tolerate low temperatures (the plant ceases to grow under temperatures below 5°C and is easily damaged by heavy frost and dies). Cultivated as a winter crop in autumn and winter in southern Yunnan below 1,000 meters above sea level, its growth period is 100 to 120 days. Cultivated as a crop sown in spring and harvested in fall on the plateau of central Yunnan above 1,000 meters above sea level where frost and freezing occur during winter, its growth period is 140 to 160 days. The seeds of guizotia obyssinica contain 39 to 41 percent oil, its yield of oil is 31 to 35 percent. The quality of the oil is good. It can be cultivated easily, and it has been popularized over 200,000 mu in Yunnan. It has already been introduced into four provinces and cities in the south central region, east China and the northwest in small amounts and it is the new oil bearing crop that is most likely to develop.

[pp 223-231] [Excerpts]

Section 4 Sugar Crops

1. General Situation of the Development of Production of Sugar Crops in Our Nation

Our nation's sugar crops include sugar cane and beets. In 1978, the sowing area totaled 13.192 million mu, constituting 0.58 percent of the total sowing area of agricultural crops. Of these, the area of sugar cane constitutes 62.4 percent of the total area of sugar crops, and beets constitute 37.62 percent. In the crop structure, they follow food grain crops, cotton and oil bearing crops, ranking four. They are one of our nation's important economic crops. In distribution, sugar cane is mainly distributed in our nation's southern southeastern coastal region, and beets are distributed in the northeast, Nei Monggol and Xinjiang, forming a distinct distribution characteristic of southern sugar cane (sugar cane) and northern beets (beets) (Figure 5-4).

But, our nation's sugar crop production still cannot satisfy the daily development of the national economy and the ever increasing needs of the people's livelihood. The supply of sugar is still short, and each year a definite amount of sugar must be imported. At present, the major problems that exist in our nation's production of sugar crops are: 1) The distribution of sugar crops is not entirely rational, the production areas are scattered, the proportion of concentrated production regions is low, the scattered production regions cover a wide area, unfavorable to the elevation of the level of production. 2) Unit yield is very low. In 1978, the nation's average per mu yield of sugar cane was 5,133 jin, only 73.9 percent of the average per mu yield (6,948 jin) of sugar cane of the world in 1975. It is also lower than the highest average per mu yield (5,655 jin, 1963) of sugar cane in our nation after Liberation by 9.23 percent. The average per mu yield of beets was 1,092 jin, only 28.3 percent of the average per mu yield (3,853 jin) of beets of the world in 1975. It is also lower than the highest average per mu yield (2,047 jin, 1951) of beets in our nation since Liberation by 46.8 percent. 3) Production of sugar crops and sugar refining industries are not coordinated. Production of sugar crops cannot satisfy the need for raw materials by the sugar refining industry. For example, in many areas, the full development of facilities and capabilities has been affected by shortage of raw materials. Of course, some sugar refineries have to transport materials over long distances because of irrational distribution. This has also affected the development of the production of sugar crops.

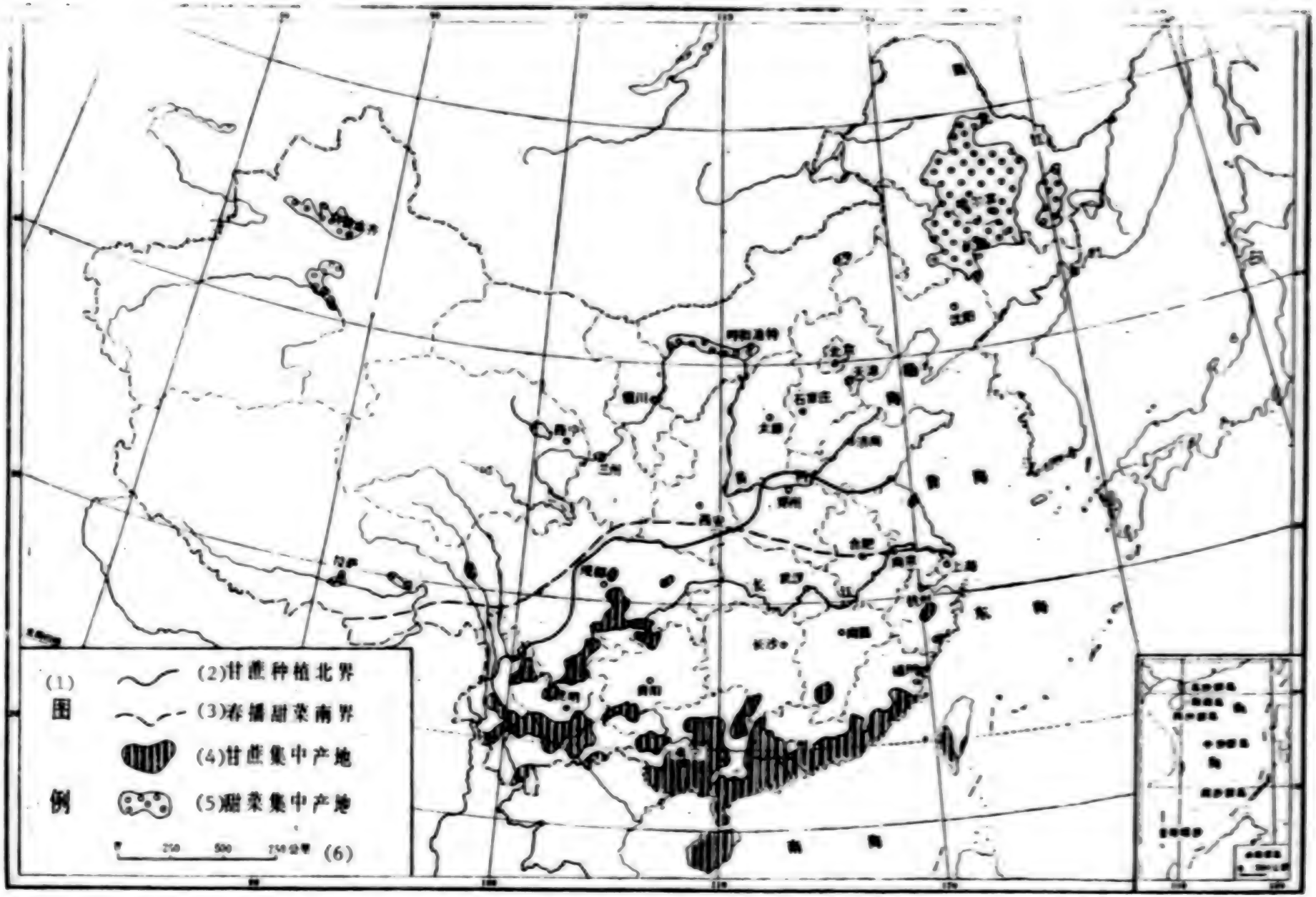


Figure 5-4 Illustrative Diagram of the National Distribution of Sugar Crops

Key: (1) Legend
(2) Northern boundary of sugar cane plantations
(3) Southern boundary of spring sown beets
(4) Concentrated sugar cane production areas
(5) Concentrated beets production areas
(6) Kilometers

Table 5-7 Major Sugar Cane Producing Regions of Our Nation*

Producing regions \ Item	Scope (county, city)	Annual average temperature	Annual cumulative temperature ≥10°C	Extreme lowest temperature (°C)	Frostless period	Rainfall (millimeter)	Soil Soil condition	Cultivated land per capita agricultural population (mu/person)	Area of sugar cane as a percentage of the national basis (%)	Per mu yield of sugar cane (jin/mu)	Total yield of sugar cane as a percentage of national total (%)	Existing problems and the direction of future development
Pearl River Delta sugar cane region	15	21.8	7,599.3	0.0	320-350	1,680.5	Sandy fields, encircled fields, basically watered land (sugar cane based land used as fish ponds)	1.22	18.0	6,339	26.6	There are more people and less land, the conflict between the use of land by sugar cane and food grain crops is great. In the future, the area must be stabilized, emphasis should be placed on increasing unit yield to establish a sugar cane producing base of stable and high yields.
Zhanjiang, Hainan sugar cane region	32	23.1	8,355.0	2.8	350	1,440.6	Latasol, mountain red soil	1.61	20.4	2,515	14.6	There are more land and less people. Management and operations are less refined, the effects of drought and typhoons are great. In the future, the productive conditions should be changed. Simultaneously increasing the unit yield and expanding the area must be insisted upon.
Guangxi sugar cane region	35	21.6	7,424.5	-2.1	300	1,280.9	Mountain red soil, river valley well-drained submergic soil	1.26	26.4	3,469	17.48	There are hilly regions and arid slopes. Water conservancy conditions are poor. Drought is serious. In the future, water conservancy construction should be done in a big way to improve the soil and control water.
Southeastern Fujian sugar cane region	19	20.8	7,344.8	2.0	320-350	1,093.7	Surface submergic soil, red soil, well-drained submergic and sandy soil	0.7	5.36	7,380	7.25	There are more people and less land. The land for use by food grains and sugar cane is insufficient. In the future, basic farmland construction should be carried out in a big way mainly to increase unit yield.

[table continued]

(continued Table 5-7)

Yunnan sugar cane region	25	19.8	6,933.6	-2.5	330	796.7	Well-drained submergic soil of alluvial soil of river banks of dammed land	1.49	7.9	4,926	7.6	The topography is complex, planting is scattered, the temperature is low, growth is slow. In the future, unit yield should be greatly increased and the area should be appropriately expanded.
Sichuan Basin sugar cane region	15	17.7	5,667.7	-3.0	300-330	1,064.0	Purplish soil with red soil and surface subsergic soil	1.16	10.34	4,353	8.8	There are more people and less land. The conflicts among the use of land, water and fertilizers for food grain crops and sugar cane are great. In the future, increasing the unit yield should be the main concern. The area in the Anning River Valley should be appropriately expanded.

*The data for Guangxi, Yunnan and Sichuan sugar cane regions were of 1978, data of the other sugar cane regions were of 1975.

Table 5-8 Major Beets Producing Regions of the Nation (1978)

Province region \ Item	Scope (county, city, banner, field)	Annual cumulative temperature >5°C	Average temperature (May-October)	Daily temperature difference (July-September)	Frostless period (day)	Rainfall (millimeter)
Heilongjiang	35	3,000	14.2 - 22.7	10.5 - 12.3	125 - 200	553.5
Jilin	16	3,300	14.9 - 22.9	10.2 - 12.4	150 - 200	610.5
Nei Monggol	12	3,000 - 3,500	13.0 - 21.8	11.8 - 12.7	125 - 150	426.1
Xinjiang	6	2,900 - 3,500	13.8 - 21.9	13.7 - 14.3	150 - 180	300 - 500

Province Region \ Item	Soil condition	Cultivated land per capita agricultural population (mu/person)	Area of beets as a percentage of national total (percent)	Average per mu yield of beets (jin/mu)	Total yield of beets as a percentage of national total	Existing problems and direction of future development
Heilongjiang	Black soil, meadow chernozem, meadow solonchak	7.0	43.87	1,129	45.46	There is more land and less people. Labor forces are insufficient. Temperatures are low, there are a lot of floods, waterlogging, diseases and insect pests. In the future, the conditions of production must be further improved, unit yield must be greatly increased. The area must be actively expanded.
Jilin	Black soil, meadow chernozem	4.34	18.5	1,085	18.48	Damage by drought and wind and sand is greater. In the future, water conservancy construction should be carried out in a big way, trees must be planted and land must be forested to break the winds and stabilize sand. Unit yield should be greatly increased and the area should be appropriately expanded.
Nei Monggol	Cultivated meadow soil, solonchak	6.53	10.37	1,208	11.51	There is more land and less people. Management is not refined. Saline and alkaline damage and damage by wind and sand are serious. In the future, the conditions of production must be changed and increasing unit yield must be emphasized.
Xinjiang	Meadow chestnut soil, meadow solonchak	6.84	5.3	1,235	6.0	The land is expansive and people are few. Transportation is not convenient. Alkaline and saline damage and damage by wind and sand and drought occur. The conditions of production should be changed in the future mainly by increasing yield and appropriately expanding the area.

[pp 233-242] [Excerpts]

Section 5 Other Economic Crops

(1) Jute (Corchorus capsularis) and Bluish Dogbane (Apocynum venetum)

Although jute and bluish dogbane are different bast fiber crops, the texture of the fibers are similar. Both can be used as raw materials for sacks. In the areas of distribution, all regions where jute can be planted, bluish dogbane can also be planted. Therefore the two are mixed in counting yield. Our nation's production of jute and bluish dogbane in 1952 was over eightfold that at the beginning of Liberation. Later, because of diseases (anthracnose of bluish dogbane and root nematode of jute) and some mistakes in work, during the 20 years up to 1972, the yield remained stagnant between 2.5 million and 6 million dan, not self-sufficient. In 1972, the party Central Committee proposed to develop the production of jute and bluish dogbane by self-reliance. In 1978, the yield reached 21.755 million dan, still not satisfying the needs of the domestic and foreign markets. At present, the unit yields of jute and bluish dogbane are not high, the development is not balanced, large area and high yielding provinces can produce 800 to 900 jin but there are also places producing only over 200 jin. Therefore increasing the unit yield, waterlogged fields, lowlands, alkaline fields, mounds, mountain ridges and infertile land must be fully utilized to develop bluish dogbane. According to the policy of "suiting measures to local circumstances and appropriate concentration," commercial bast fiber bases should be gradually established.

(2) Ramie

But at the time of Liberation, our nation's ramie production dropped drastically to 300,000 dan. After Liberation, our nation's production of ramie rapidly revived and developed, reaching 1.3 million dan in 1958. Because the production of ramie became mainly used for domestic consumption, and because of some problems in production, in recent years, the production of ramie has remained in a fluctuating state.

3. Hemp

Hemp has a strong ability to adapt to natural conditions. Its regions of production are found throughout the nation, but the major producing regions are the provinces north of Qinling and Hui River and regions of the northeast, and the most is found in Heilongjiang, Anhui, Shandong, Jilin and Hebei provinces. In 1975, these 5 provinces produced 61 percent of the total national yield. The best quality hemp fiber is produced in Weixian in Hebei Province and Luan in Shanxi Province. At present, the unit yield of hemp is too low. Since 1971, the per mu yield has only been over 60 jin. The key to increasing yield is deep plowing and fertilization. Hemp varieties can also be introduced into the northern hemp producing regions from the southern low latitude regions, and long sunshine conditions can be utilized to extend the growth period of hemp and increase the quality of hemp fiber.

2. Silk

(1) Sericulture

The four provinces of Zhejiang, Sichuan, Jiangsu and Guangdong (including the four regions mentioned above) are our nation's major sericulture production regions. In 1975, the four provinces' sericulture production constituted 88 percent of the national total. Also according to statistics of 1973, the 4 provinces above had a total of 50 counties with annual production of 10,000 dan of silkworm cocoons. Wuxing County in Zhejiang Province produces 200,000 dan of cocoons annually, Tungxiang County produces over 155,000 dan, Haining County produces 131,000 dan, Shunde County in Guangdong Province produces 180,000 dan. These are the four counties that produce the most in our nation's sericulture. In addition, Shandong, Hubei, Anhui, Shaanxi provinces also produce over 40,000 dan of cocoons annually. Provinces and regions that produce over 10,000 dan annually are: Guangxi, Henan, Hebei, Shanxi, Hunan, Yunnan, Xinjiang. Sericulture production is scattered in other provinces and regions and the yields are very small.

In 1972, the nation produced 2.72 million dan of cocoons, over fourfold that at the beginning of Liberation. In 1978, the yield reached 3.466 million dan, the highest yield of cocoons since Liberation. But our nation's yield of silkworm cocoons has not yet reached the highest annual yield of 4.22 million dan (1929) of the past, and the needs of developing the production of the domestic silk weaving industry still cannot be satisfied. At present, the supply of raw material cocoons cannot satisfy the demands of the silk weaving industry in the provinces of Jiangsu, Guangdong, Anhui, Shandong, Hubei, Shaanxi, and Jiangxi. For example, Jiangsu Province now has the facilities and capabilities for silk weaving and can produce 3,800 tons of raw silk annually but at present the province only produces 2,500 tons. The supply of silk products cannot meet the demands of the domestic and foreign markets. Therefore, sericulture production must be developed in a big way by establishing the industry at home and seeking exports.

(2) Tussah Silk and Castor Silkworm

Tussah is our nation's specialty. It originated in Shandong and has a history of over 2,000 years. In past years, our nation's production of tussah silkworm cocoons has constituted over 90 percent of the world's total yield. At the beginning of Liberation, the yield of tussah silkworm cocoons was only 240,000 dan. During the past 10 years, except for a few years, the yields fluctuated between 700,000 and 800,000 dan. Tussah silk and tussah silk fabric are unique products of our nation. They are mainly exported to Western Europe and they are popular in the international market. In 1976, exports of tussah silk reached 538 tons, far from satisfying the needs of foreign and domestic markets. Our nation's tussah forest resources are estimated at over 100 million mu, mainly distributed in Heilongjiang, Nei Monggol, Liaoning, Anhui, Shandong, Henan, Hubei, Guizhou and Jilin provinces and regions. At present, only one-tenth is being utilized. The potential for developing tussah silk is great. The present tussah producing region is Liaoning Province. In 1978, it produced

74.5 percent of the national total. Together with Henan, Shandong and Heilongjiang provinces,they produced 94.1 percent of the national total. In addition, Guizhou, Jilin, Hubei and Sichuan provinces produced over 10,000 dan of cocoons. Other provinces such as Shaanxi, Anhui, Hebei also produce a little. At present, tussah silkworms are still naturally hatched and the supply is insufficient. Protection of the tussah forests is poor. The unit yield of tussah is low and unstable. As new regions of tussah are developed, these problems must be solved.

Castor silkworm is mainly produced in Shandong, Henan, Hebei, Anhui, Guangdong, Guangxi provinces and regions (Figure 5-7). Castor and cassava leaves are used to develop the production of castor silkworm. The quality of castor silk is poor. It can only be used as raw material for silk spinning. It is mainly for domestic consumption and it is not popular as an export. The yield is small.

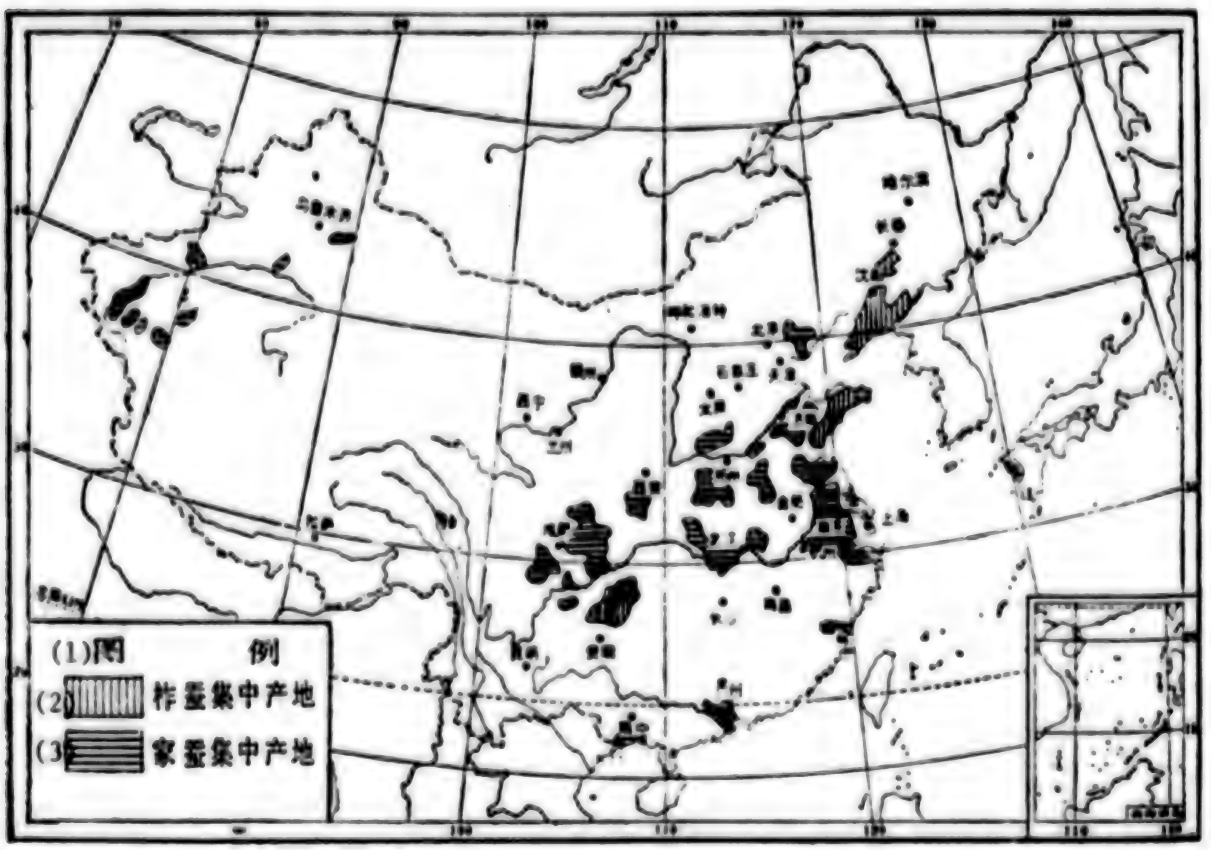


Figure 5-7 National Distribution of Silkworm Cocoon Producing Regions

Key:
(1) Legend
(2) Concentrated tussah producing regions
(3) Concentrated domesticated silkworm producing regions

3. Tea

After Liberation, our nation's tea production rapidly revived and developed. In 1952, the yield grew onefold over that in 1949. The area of tea plantations returned to 3.36 million mu. In 1957, the yield of tea increased by 36 percent over that in 1952. The area of tea plantations expanded to 4.94 million mu. At the beginning of the 1960s, because of serious natural disasters and some mistakes in work, tea production dropped continuously for 3 years. But since 1963, leadership has been strengthened, and the campaign to greatly develop tea and "to develop more tea plantations on mountain slopes" was implemented and propagandized deeply among the broad tea regions. The enthusiasm of the broad masses to reform the mountain regions and to develop production was mobilized and tea production increased year after year. In 1976, the tea production surpassed the highest level of the past (1886).

At present, our nation's tea regions are still mainly distributed in the provinces and regions south of Qinling and the Hui River. Zhejiang, Hunan, Sichuan and Anhui are our nation's four major tea regions. The 4 provinces produce about 60 percent of the total yield of tea of the nation, followed by Fujian, Yunnan and Hubei with a yield constituting one-fourth the national total. Other provinces and regions such as Guangdong, Guangxi, Jiangxi, Guizhou, Taiwan are also our nation's important tea regions (Figure 5-8).

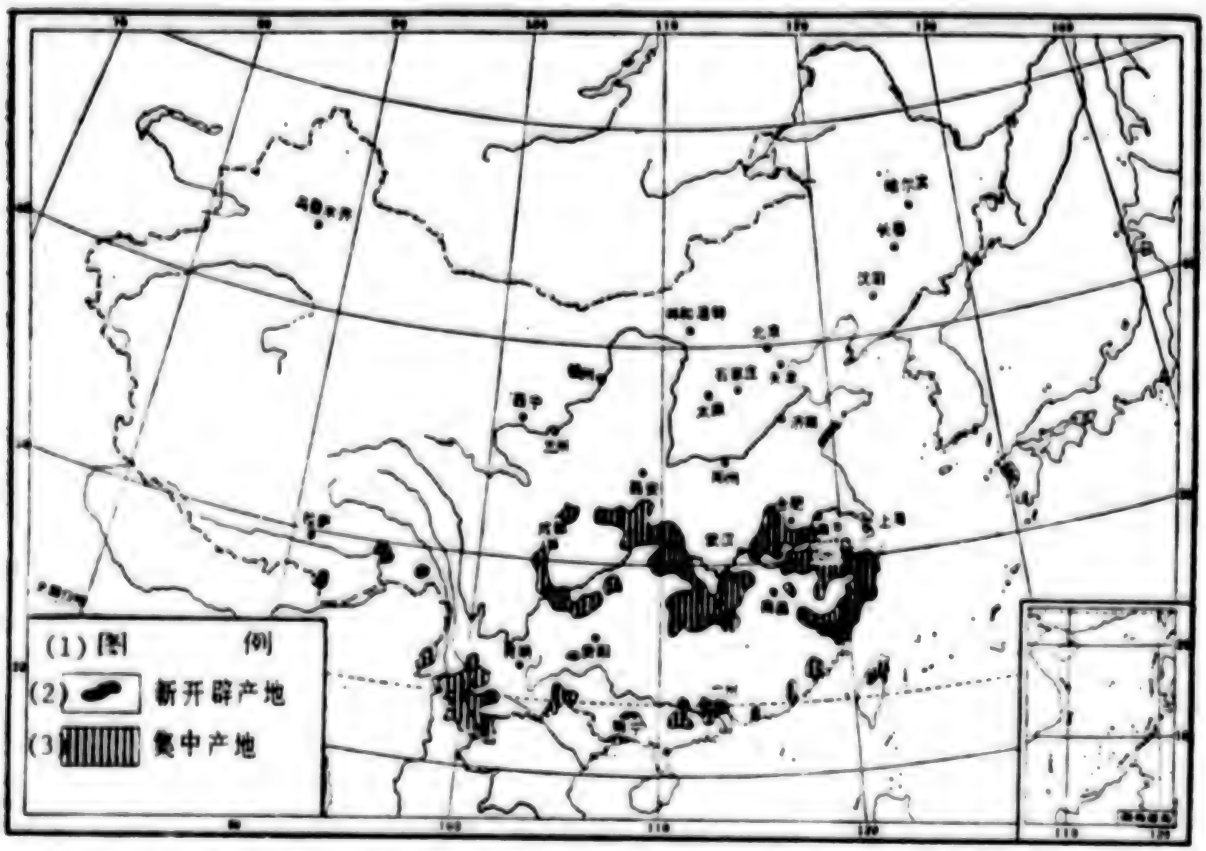


Figure 5-8 National Distribution of Tea Producing Regions

Key: (1) Legend
(2) Newly developed tea producing regions
(3) Concentrated tea producing regions

Our nation has many varieties of tea. According to the differences in the methods of processing, they can be divided as follows: 1) black tea, mainly for export, constitutes 22 percent of the total yield; 2) green tea, for domestic consumption and export, constitutes 44 percent of the total yield; 3) pressed tea, also called brick tea or national minority style tea, constitutes 25 percent of the total yield, mainly for the supply of brother national minority regions; 4) scented tea, mainly for domestic consumption, is most popular in regions of the northeast and north China, and constitutes 6 percent of the total yield; 5) oolong tea is a semi-fermented tea, mainly for export to Southeast Asia, and is liked by overseas Chinese.

4. Tobacco

In 1978, the area of flue cured tobacco was 10 times that in 1949. The total yield and state purchased fine cured tobacco amounted to an increase of over 24 times that in 1949. It is one of the economic crops that has developed more rapidly.

In the areas of distribution, except for Beijing, Tianjin and Shanghai, Qinghai, Ningxia, Xinjiang, Xizang, flue cured tobacco is produced at all places throughout the nation. The production of flue cured tobacco of the 4 provinces of Henan, Shandong, Yunnan and Guizhou constitutes 67.5 percent of the nation's total yield. Henan produces the most flue cured tobacco, constituting 28 percent alone, followed by Shandong which constitutes 17 percent, Yunnan which constitutes 12 percent, and Guizhou which constitutes 8 percent. They are followed by Guangxi, Liaoning, Anhui, Hunan, Sichuan, Hubei, Guangdong and Jilin. Other provinces, such as Hebei, Shanxi, Jiangsu, Zhejiang and Jiangxi are new tobacco regions (Figure 5-9), but the present yield is not high.

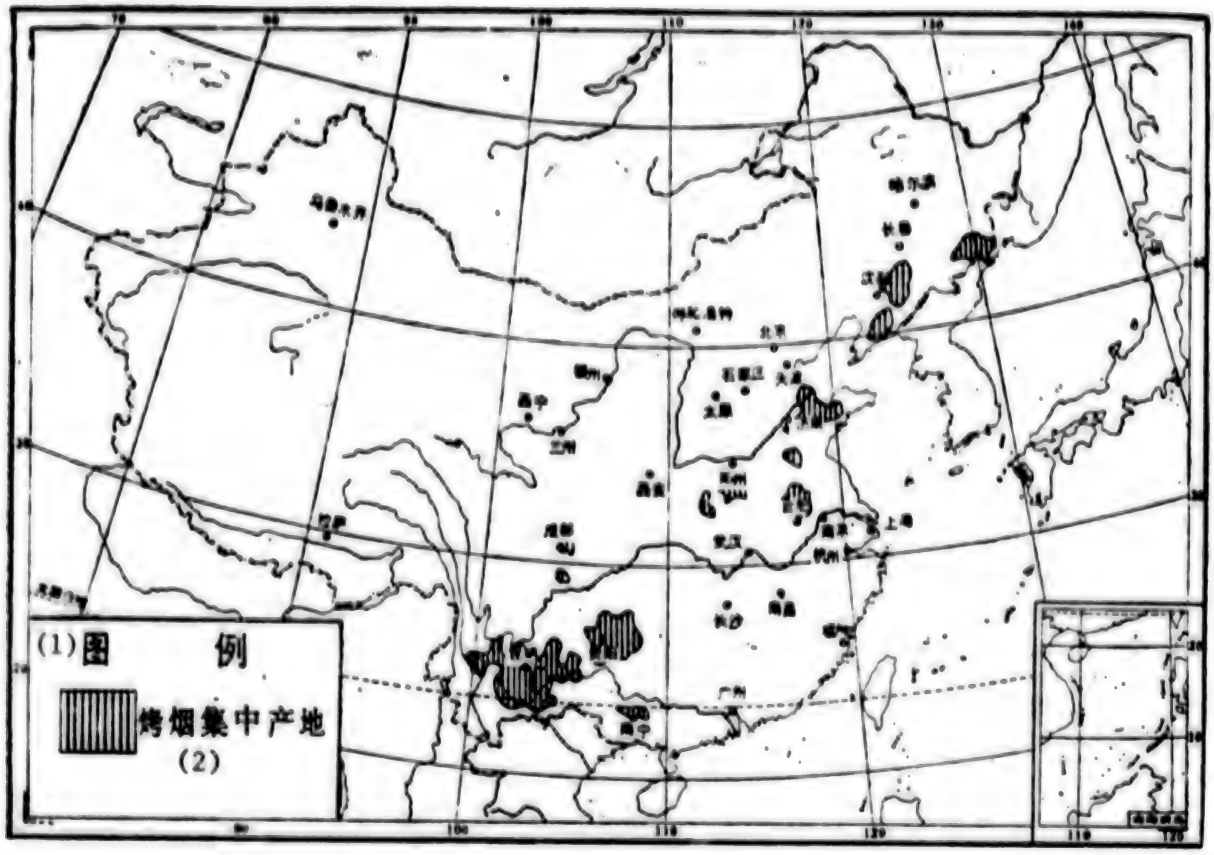


Figure 5-9 Concentrated Flue Cured Tobacco Producing Regions of the Nation

Key:
(1) Legend
(2) Concentrated flue cured tobacco producing regions

[pp 243-265] [Excerpts]

Chapter VI Development and Distribution of Our Nation's Forestry Production

Section 1 Our Nation's Forest Resources and Their Distribution Characteristics

Table 6-1 Forest Resources of Each Province and Region of the Nation

Province (region)	Area (10,000 hectares)	Reserve (million cubic meters)	Vegetation (percent)
Sichuan	746	1,347	13.3
Guizhou	256	159	14.5
Yunnan	956	989	24.9
Xizang	632	1,436	5.1
Shaanxi	459	244	22.5
Gansu	188	198	3.2
Qinghai	19	31	0.3
Ningxia	8	4.8	0.5
Xinjiang	144	237	0.9
Henan	178	79	10.9
Hubei	436	96	23.5
Hunan	658	189	31.1
Guangxi	551	193	23.3
Guangdong	749	177	33.9
Jiangsu	34	13	3.3
Zhejiang	396	82	38.9
Anhui	175	47	12.7
Fujian	590	243	48.5
Jiangxu	611	263	36.7
Taiwan	208	186	57.8
Shandong	132	23	8.7
Hebei	202	73	10.8
Shanxi	109	57	7.0
Nei Monggol	34	9.2	0.8
Liaoning	415	98	17.8
Jilin	756	730	25.8
Heilongjiang	2,520	2,324	34.9

Table 6-2 Ratio of Different Origins of Our Nation's Forests

Origin of Forests	Virgin forests	Natural secondary forests	Man-made forests
Area of forests (percent)	31	46	23
Forest reserves (percent)	75	23	2

Table 6-3 Ratio of the Age Groups of Our Nation's Forest Resources

Age group	Young forests	Middle-aged forests	Nearly mature forests	Mature and overly mature forests
Area (percent)	42	17	9	32
Reserve (percent)	7	13	15	65

Table 6-4 Ratio of Major Types of Trees of Our Nation's Forest Resources

Type of trees	Ratio	
	Reserve	Area
Conifers	56.2	55.2
Broadleaf trees	43.8	44.8
Of the conifers:		
Pinus koraiensis	1.8	
Abies fabri	11.3	
Picea asperata	14.1	
Larix dahurica	10.1	
Pinus tabulaeformis	1.4	
Pinus armandii		
Pinus massoniana	6.0	
Pinus yunnanensis	8.8	
Cunninghamia lanceolata	2.5	
Others	0.2	

Table 6-5 Growth of Forests in Each Province and Region of the Nation

Region	Growth rate (percent)	Total growth of live and standing trees (10,000 cubic meters)	Amount of growth of forested land (10,000 cubic meters)	Amount of growth per hectare (cubic meters)
Nation	2.66	22,629	19,317	1.841
Sichuan	1.58	2,128	1,962	2.747
Guizhou	3.88	616	485	2.120
Yunnan	2.19	2,165	1,995	2.165
Xizang	1.72	1,055	994	4.412
Shaanxi	3.12	760	720	1.660
Gansu	2.41	477	449	2.427
Qinghai	1.59	49	38	1.992
Ningxia	4.92	21	18	3.407
Xinjiang	1.95	462	401	2.894
Henan	13.67	1,074	600	5.235
Hubei	4.24	408	340	0.901
Hunan	4.73	896	709	1.537
Guangxi	4.01	772	619	1.258
Guangdong	4.23	748	702	0.938
Shanghai	7.50	2	--	0.750
Jiangsu	7.50	94	24	1.202
Zhejiang	7.00	577	502	1.641
Anhui	6.08	285	254	1.681
Fujian	495	1,206	970	1.891
Jiangxi	4.52	1,187	986	2.108
Shandong	11.27	258	92	0.970
Beijing	4.08	18	8	0.733
Tianjin	11.74	23	2	2.616
Hebei	11.74	859	533	3.607
Shanxi	6.46	364	235	2.311
Inner Mongol	9.67	89	57	1.777
Liaoning	4.58	447	424	1.406
Jilin	2.05	1,539	1,437	2.014
Heilongjiang	1.77	4,113	3,761	1.500

Table 6-6 Statistics of the Forest Resources of the Central South Subtropical Zone

Province region	Forest regions	Area of forest region (10,000 mu)	Area of forest (10,000 mu)	Percentage of vegetation of forests	Forest reserves (10,000 cubic meters)	Number of bamboo trees (10,000 trees
Zhejiang	Oujiang	3,510	1,485	42.3	1,827	6,453
Jiangxi	Fuhe	2,280	645	28.3	928	2,700
	Upper reaches of Ganjiang	4,455	1,830	41.1	3,208	8,968
	Jiulingshan	2,685	1,110	41.3	1,609	9,756
	Leanhe	1,185	480	40.5	749	1,387
Fujian	Jianxi	2,415	690	28.6	5,182	1,040
	Shafu	3,960	1,395	35.2	10,474	22,061
	Mainstream of Minjiang	3,150	540	17.1	3,846	7,075
	Jiulongxi	1,965	330	16.8	1,847	3,198
	Dingjiang	1,755	540	30.8	3,265	5,693
Hunan	Xiaoshui	2,145	465	21.7	1,107	877
	Yuanjiang	2,100	855	40.7	4,799	7,576
	Laishu	1,785	555	31.1	2,069	3,409
	Northwestern Hunan	2,970	780	26.3	929	1,293
Guangdong	Northern Guangdong	5,445	1,695	31.1	3,155	
	Eastern Guangdong	2,115	900	42.6	1,091	
	Suijiang	885	390	44.1	1,039	
Guangxi	Rongjiang	1,980	435	22.0	2,144	4,174
	Hongshuihe	2,910	360	12.4	1,313	388
Guizhou	Qingshuijiang	1,785	285	16.0	1,230	
	Duliujiang	1,380	180	13.0	672	
Yunnan	Middle and lower reaches of Nanpanjiang	2,265	285	12.6	1,371	56
	Babianjiang	2,085	630	30.2	4,533	4,390
	Yuanjiang	3,540	885	25.0	4,407	2,184
	Lancangjiang	1,985	3,570	29.8	31,332	33,257
		72,735	21,335	--	94,126	125,935

Section 2 General Situation and Characteristics of the Development of Forestry Production

1. General Situation of the Development of Forestry Production

For the past 28 years, our nation's forestry production has realized great achievements. Up to 1977, the preserved area of newly planted forests of the nation was 420 million mu. Of these, the preserved area of forests planted by the state was 90 million mu. The northwest regions planted forests to break winds and stabilize sand and forests to retain water and soil. The southern provinces planted timber forests mainly of cunninhamia lanceolata of 80 million mu. In north China and the Zhongyuan plains, trees planted "on the 4 sides" numbered about 4 billion, and massive amounts of protective forests for farmland were planted. At present, the nation's forest area has reached 1.82 billion mu, the reserve of forest wood is 9.5 billion cubic meters, the percentage of vegetation of forests has reached 12.7 percent. These forests have served greatly to break winds, stabilize sand, retain water and soil, and assure increases in agricultural production. In the past 28 years, a total of 810 million cubic meters of wood has been produced. At present, our nation's annual yield of wood has increased from the over 5 million cubic meters at the beginning of Liberation to 410 million cubic meters, an increase of over sixfold. Lumber processing and chemical industries of forestry products have also developed relatively greatly. State-run forestry enterprises have accumulated 11 billion yuan for the state, 137 percent of the total state investment during the same period. This has forcefully supported the nation's socialist construction and satisfied the needs of the people's livelihood.

2. Present Structure of Forest Land and Its Production Characteristics

Our nation presently has a total of 3.864 billion mu of land for forestry use, 26.8 percent of the total area of the entire nation. The land for forestry use includes forest land, sparse woods, shrubs, nurseries, young forests, and land not forested, totaling 1.8279 billion mu, 12.7 percent of the total area of the nation. The present forest reserves total 9.5 billion cubic meters, most of these are natural forests. According to the classification of forest types, 80 percent are timber forests, followed by economic forests, protective forests, firewood forests, bamboo forests, special forests. According to age group, half is nearly mature forests, mature forests and overly mature forests, and the other half is middle aged and young forests.

(3) Economic Forests

Including woody oil and food bearing trees, fruit trees and special economic forests. At present, the areas of economic forests throughout the nation total 127.8 million mu, 0.88 percent of the total area of the nation.

1. Woody Oil and Food Bearing Forests

Since Liberation, our nation's economic forests realized great development. Up to 1975, the area of woody oil and food bearing plants totaled 60 million mu,

Table 6-7 Composition of Our Nation's land for Forestry Use*

Forest types \ Items		Area (10,000 mu)	Percentage of the national total
National total		1,438,875	100
	Land for forestry use of the nation	386,400	26.8
	Presently existing forest land	182,790	12.7
	Sparse forests	23,445	1.6
	Shrubs	44,355	3.1
	Nurseries	315	0.02
	Immature forests and not forested land	135,495	9.4
In the presently existing forest land	Timber forests	147,000	10.22
	Protective forests	11,775	0.82
	Economic forests	12,780	0.88
	Bamboo forests	4,725	0.33
	Firewood forests	5,505	0.38
	Special forests	1,005	0.07
In the economic forest land	Fruit trees	6,075	0.42
	Woody oil and food bearing trees	6,396	0.44
	Special economic forests	306	0.02

*Based on the general forestry survey data of 1976 issued by the National Forestry Bureau.

over 5 billion trees. Of these, oil tea trees constitute 50 percent, walnut 14 percent, oil tung trees 11 percent, jujube trees 8 percent, mountain apricot 6 percent.

Comparison of the yield of woody oil bearing plants in 1977 and that before 1977 shows that oil tea seeds dropped 26 percent, walnut dropped 27 percent, tung tree seeds dropped 47 percent, and tallow seeds dropped 38 percent.

2. Fruit Trees

Our nation's fruit trees are distributed throughout the nation. The area of planting has reached 22 million mu. Of these, the six kinds of fruit trees, apple, peach, oranges and tangerines, bananas, grape, pineapple are the major ones. In 1975, our nation's yield of major fruits reached over 5 million tons.

Apple is one of the major fruit trees cultivated in our nation. It is also the major export fruit. In 1975, the yield was about 1.6 million tons. The concentrated producing areas are in southern and western Liaoning, Shandong Peninsula and eastern Hebei. Since Liberation, the newly established fruit producing region along the ancient route of the Yellow River (in Henan, Shandong, Jiangsu and Anhui provinces) and the fruit producing region at the northern foothills of Qinling (Central Shaanxi and Tainshui area in Gansu) have also become one of the important apple producing regions.

Pear is a fruit that is very popular among the people of our nation. It is cultivated in the north and the south. In the future, it will continue to be developed as a major fruit. In 1975, the yield of pears totaled about 1.04 million tons.

(4) Bamboo Forests

Our nation presently has an area of 47 million mu of bamboo forests, about 22 billion trees. This includes only large diameter bamboo trees with a breast of 5 to 10 centimeters. The major varieties are phyllostachys pubescens (nanzhu), dendrocalamus giganteus, phyllostachys bambusoides, phyllostachys nigra, bambusa textilis, bambusa flexuosa and sinocalamus affinis. All of these large diameter bamboo varieties are distributed in our nation's subtropical regions especially in Zhejiang, Jiangxi, Fujian, Guangdong and Guangxi, Sichuan, Anhui and Jiangsu provinces and regions. There are 8 provinces and regions that have over 1 billion bamboo trees. Of these, there are 81 counties that have over 10 million bamboo trees. It can be seen that the distribution of bamboo forests is relatively concentrated.

[pp 281-302] [Excerpts]

Chapter VII Development and Distribution of Our Nation's Livestock Production

Table 7-1 Yield of Grass of All Types of Grasslands

Types	Provinces and regions of major distribution	Yield of grass (dry weight, jin/mu)
Alpine and subalpine meadow	Xinjiang, Xizang, western Sichuan	70-100
Lowland meadow	Nei Monggol, Xinjiang	70-120
Meadow steppe	Western part of the northeast, eastern Nei Monggol	80-150
Mountain steppe	Xinjiang	50- 80
Dry steppe of high altitude plains	Nei Monggol	30 (west)-70 (east)
Desert steppe	Western Nei Monggol, Ningxia	30- 50
Stepped desert	Western Nei Monggol	10- 20
Desert in plains	Xinjiang, western Nei Monggol	20-30-50

Table 7-3 Number of Various Domesticated Animals in Cultivated Land in Grazing and Farming Regions of Our Nation as a Percentage of the National Total (percent)

Item	Grazing region	Farming region
Area of land	52.0	48
Area of cultivated land	10.4	89.6
Farming population	3.2	96.8
Cattle	25.1	74.9
Horses	43.8	56.2
Donkeys	24.9	75.1
Mules	7.6	92.4
Camel	73.1	26.9
Goats	29.4	70.6
Sheep	63.6	36.4
Hogs	3.7	96.3
Total number of head	22.1	77.9
Converted total number of head	19.7	80.3

Table 7-4 Structure of the Kinds of Domesticated Animals in Our Nation's Grazing and Farming Regions (percent)

Item / Region	Cattle	Horses	Donkeys	Mules	Camel	Goats	Sheep	Hogs
Nation	33.7	5.4	2.3	1.3	0.4	4.0	8.0	44.8
Grazing region	43.0	12.1	2.9	0.5	1.4	6.0	25.7	8.5
Farming region	31.5	3.8	2.2	1.5	0.1	3.5	3.6	53.7
Northern farming region	26.8	6.1	4.0	2.8	0.3	4.9	6.2	48.9
Southern farming region	36.1	1.6	0.4	0.3	-	2.2	1.1	58.4

Table 7-5 Development of Domesticated Livestock in Our Nation in Past Years (percent)

Year	Total	Large Livestock	Hogs	Sheep and Goats	Remark
1949	100.0 (160,12*)	100.0 (6,002*)	100.0 (5,775*)	100.0 (4,235*)	Lacking figures for Taiwan Province
1955	162.4	145.9	152.1	199.5	
1965	243.8	140.0	289.0	328.1	
1971	309.9	158.8	425.7	354.5	
1978	352.9	156.4	521.7	401.3	
Average increases over 30 years	8.4	1.9	14.1	10.0	

*(10,000 head)

Table 7-5 Structure of the Types of Livestock in Our Nation's Grazing Zones

(1) 分区	(13) 头数标准	(17) 牛	(18) 马	(19) 驴	(20) 骡	(21) 骆驼	(22) 山羊	(23) 绵羊	(24) 猪	(25) 备注
(2) 牧区	(14) 自然头数	15.3	4.2	2.3	0.1	0.3	19.7	49.1	9.0	此表以1971年统计数字为基础，个别县参考1965年和1973年予以补充 (26)
	(15) 折合绵羊单位	40.0	13.0	3.6	0.4	1.4	7.2	25.5	9.3	
(3) 草原区 (4) 森林草原区	(14) 自然头数	17.4	6.8	6.4	0.7	—	8.9	10.8	49.0	
	(15) 折合绵羊单位	32.6	15.3	7.2	1.6	0.1	2.3	4.1	36.8	
(5) 干草原区	(14) 自然头数	7.2	5.1	0.9	0.3	0.6	26.0	47.1	12.8	
	(15) 折合绵羊单位	21.4	18.5	1.7	1.2	2.8	10.9	28.1	15.3	
(6) 荒漠区 (7) 山地区	(14) 自然头数	11.2	7.1	0.8	0.1	0.5	11.9	67.0	1.4	
	(15) 折合绵羊单位	30.5	23.1	1.3	0.2	2.3	4.5	36.6	1.5	
(8) 平原区	(14) 自然头数	8.8	5.0	3.6	—	0.6	16.7	61.7	3.6	
	(15) 折合绵羊单位	25.8	17.5	6.4	0.1	2.7	6.9	36.3	4.3	
(9) 高寒草甸区	(14) 自然头数	3.5	1.8	0.4	0.1	—	11.4	53.2	2.6	
	(15) 折合绵羊单位	65.8	4.8	0.5	0.1	—	3.5	23.0	2.3	
(10) 高寒草原区 (11) 北部高原区	(14) 自然头数	14.8	0.6	—	—	—	64.9	19.6	0.1	
	(15) 折合绵羊单位	51.8	2.7	—	—	—	31.8	13.7	—	
(12) 南部高原山地区	(14) 自然头数	21.4	0.7	1.6	—	—	26.2	49.0	1.1	
	(15) 折合绵羊单位	57.6	2.2	2.5	0.2	—	9.9	26.4	1.2	

(27) 注：折合绵羊单位比例：骆驼8，马骡6，牛5，驴3，猪2，山羊0.7

Key:

(1) Zones
(2) Grazing regions
(3) Steppe regions
(4) Forest steppe regions
(5) Dry steppe regions
(6) Deserts
(7) Mountain regions
(8) Plains
(9) High and cold meadow regions
(10) High and cold steppe regions
(11) Northern plateaus
(12) Southern plateau and mountain regions
(13) Standard of the number of head
(14) Natural number of head
(15) Converted sheep unit
(16) Livestock
(17) Cattle
(18) Horses
(19) Donkeys
(20) Mules
(21) Camel
(22) Goats
(23) Sheep
(24) Hogs
(25) Remark
(26) This table is based on statistics of 1971. For individual counties, the statistics of 1965 and 1973 were used as reference and supplement
(27) Footnote: Ratio of conversion of sheep units: Camel 8, horse and mule 6, cattle 5, donkey 3, hog 2, goat 0.7.

[pp 309-327] [Excerpts]

Chapter VIII Question Concerning the Development and Utilization of Our Nation's Aquatic Resources

Table 8-1 Total Yield of Aquatic Production of the Nation in Past Years

Year	Total yield of aquatic production (10,000 tons)	Increases over 1949(%)
1949	44.8	
1952	172.9	286.1
1957	311.6	595.7
1965	298.4	566.3
1970	318.4	610.9
1973	393.1	777.7
1975	441.2	884.8

Table 8-2 Structure of the Yield of Aquatic Products of the Nation in Past Years

Year	Total yield of aquatic products (percent)	Include: Ocean aquatic products as a percentage of total yield (percent)	Include: Fresh water aquatic products as a percentage of total yield (percent)
1949	100	66.6	33.4
1952	100	61.3	38.7
1957	100	62.2	37.8
1965	100	67.5	32.5
1970	100	71.6	28.4
1973	100	74.1	25.9
1975	100	75.9	24.1

1. Major Economic Fishes and Their Activity Patterns

Our nation's ocean aquatic production is mainly the production of fish. In 1975, ocean fish production constituted 76.3 percent of the total yield of ocean aquatic production, followed by shrimps and crabs which constitute 12.1 percent, and smaller percentages of shellfish and marine algae, 6.7 and 4.9 percent respectively. Our nation's ocean fish are mainly large and small yellow croaker, hairtail and squid (not considered as fish), commonly called the four major economic fishes. In 1975, their yield constituted 27.2 percent of the total ocean aquatic yield. Because of various reasons, since 1960, the resources of large and small yellow croaker have diminished while the yield of hairtail increased greatly. In 1975, the hairtail yield was the highest,

constituting 18.8 percent of the yield of ocean fish, followed by large yellow croaker, 5.5 percent, and chub mackerel, 3.3 percent. The yield of small yellow croaker dropped from 9 percent of the total yield in 1957 to 2.2 percent. Our nation's production of algae developed rapidly. In 1952, their yield constituted only 0.6 percent of the yield of ocean aquatic production. In 1975, this rose to 4.9 percent. Of these, kelp is the main product. In 1975, the yield of kelp constituted 97.3 percent of the yield of algae.

Table 8-3 Statistical Analysis of the Ocean Aquatic Production of Shandong Province, 1965-1972 (Unit: ton)

Year	Total yield	Increase (decrease) from previous year	Include yield from aquatic culture	Increase (decrease) from previous year	Yield from aquatic culture as a percentage of total yield (%)
1965	355,952	- 9,233	12,196	+ 2,955	3.4
1966	367,676	+11,724	20,055	+ 7,859	5.5
1967	365,823	- 1,853	38,424	+18,369	10.5
1968	289,173	-76,650	37,200	- 1,224	12.8
1969	272,803	-16,370	43,214	+ 6,014	15.8
1970	317,098	-44,295	43,621	+ 407	13.8
1971	376,651	-59,553	71,416	+27,795	18.9
1972	466,065	-89,414	83,781	+12,365	17.9
1975	521,147	+55,082	100,442	+16,661	19.3

Table 8-4 Structure of Fresh Water Aquatic Production of the Nation Over Past Years

Item		Year 1954	1957	1965	1970	1975
Total yield of aquatic production (percent)		100	100	100	100	100
Include	Amount of natural catch as a percentage of the total yield	69.1	52.1	47.0	34.9	29.3
	Amount of artificial cultivation as a percentage of the total yield	30.9	47.9	53.0	65.1	70.7
Area of artificial cultivation as a percentage of the area suitable for culture		6.2	21.0	41.0	49.0	6[illegible].0

[pp 337-377] [Excerpts]

Chapter IX Question Concerning the Development of Our Nation's Agricultural Zones

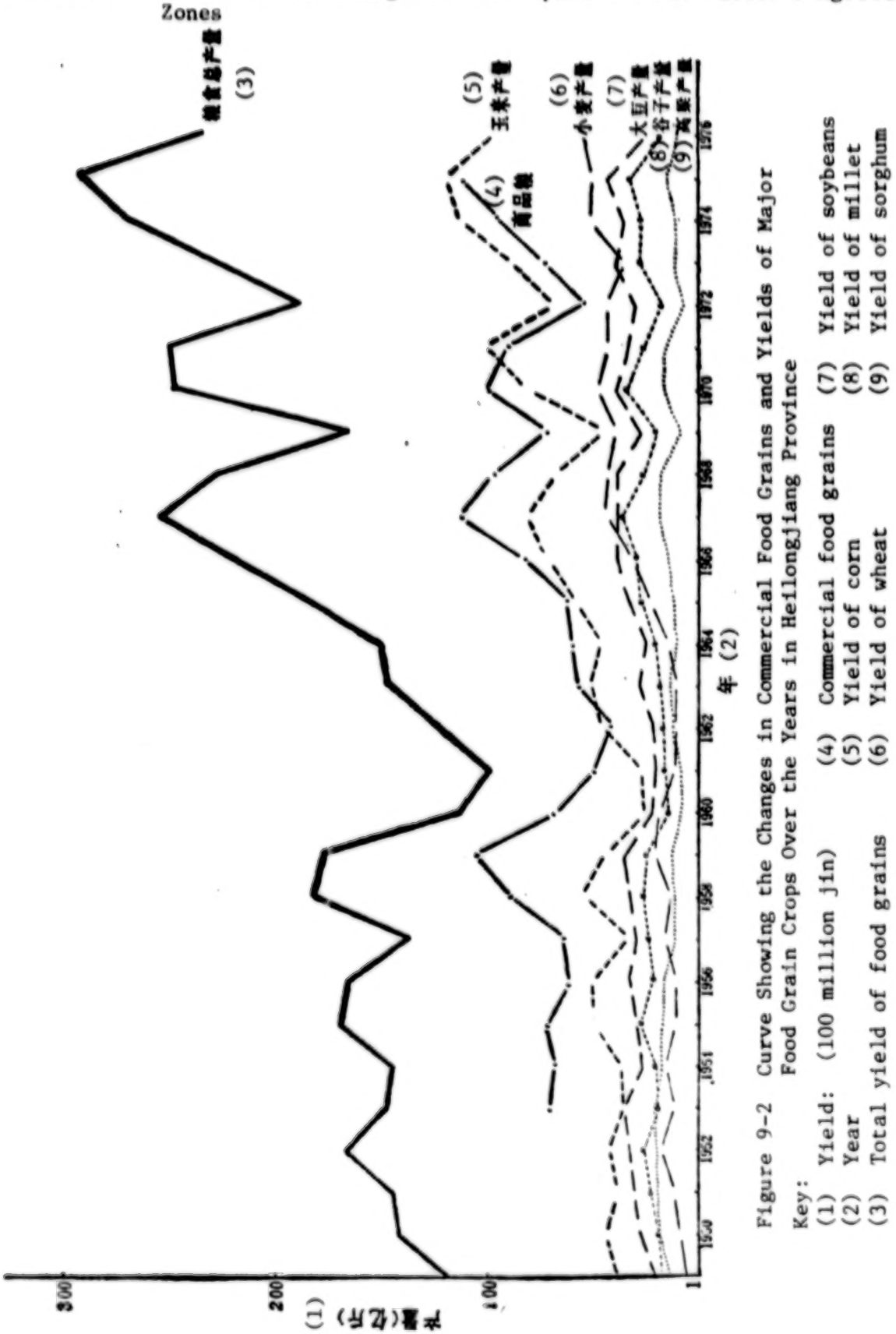


Figure 9-2 Curve Showing the Changes in Commercial Food Grains and Yields of Major Food Grain Crops Over the Years in Heilongjiang Province

Key:
(1) Yield: (100 million jin)
(2) Year
(3) Total yield of food grains
(4) Commercial food grains
(5) Yield of corn
(6) Yield of wheat
(7) Yield of soybeans
(8) Yield of millet
(9) Yield of sorghum

Table 9-3 Production of Paddy Rice in the Agricultural Regions of the Middle and Lower Reaches of the Changjiang (1971) (Unit: 10,000 mu)

Regions	Item: Area of Early rice	Area of intermediate-late rice	Area of single season rice as a percentage of paddy fields (percent)	Area of double season late rice	Area of double season rice as a percentage of paddy fields (percent)
Jiangxi	2,710.2	302.4	9.7	2,034.4	65.6
Anhui	1,102.3	1,233.2	51.1	782.0	32.4
Jiangsu	1,055.6	1,504.6	45.8	946.6	28.8
Zhejiang	1,870.3	--	--	1,600.0	73.2
Hubei	1,590.8	1,060.8	38.6	1,618.2	56.4
Hunan	2,898.9	966.4	23.5	2,875.7	70.1
Shanghai	197.7	55.5	19.3	264.2	56.8
Total	11,420.8	5,122.9	26.3	10,121.1	52.0

Table 9-4 Winter Fallow Land of the Agricultural Region of the Middle and Lower Reaches of the Changjiang (1971)

Region	Area of cultivated land (percent)	Winter fallow land as a percentage of cultivated land (percent)
Jiangxi	100	23.4
Anhui	100	35.8
Jiangsu	100	26.0
Zhejiang	100	13.3
Hubei	100	24.9
Hunan	100	27.3
Xinyang/Nanyang	100	45.3
Shanghai	100	9.8
Average total	100	27.7

Remark: Figures for Anhui, Jiangsu and Hubei are for the whole province.

Table 9-5 Sowing Area of Green Manure in the Agricultural Region of the Middle and Lower Reaches of the Changjiang (1971)

Region	Area of paddy fields (percent)	Area of green manure as a percentage of paddy fields (percent)
Jiangxi	100	68.8
Anhui	100	40.2
Jiangsu	100	31.1
Zhejiang	100	61.1
Hubei	100	56.2
Hunan	100	65.3
Xinyang/Nanyang	100	31.6
Shanghai	100	15.7
Entire Area	100	52.7

Table 9-6 Production Levels of Early Rice, Double Season Late Rice, Wheat in the Agricultural Region of the Middle and Lower Reaches of the Changjiang (1975)

Item \ Crop	Early rice	Double season late rice	Wheat
Sowing area (10,000 mu)	11,715.2	11,347.7	7,039.0
Unit yield (jin)	611	356	213
Total yield (100 million jin)	715.3	403.5	150.2

Remark: Figures for Anhui, Jiangsu and Hubei are for the entire province.

92[illegible]6
CSO: 4007

- END -

END OF FICHE DATE FILMED

5/12/81